

5 | Parking Demand

As part of the City of Durham Downtown Parking Study, Kimley-Horn and Associates developed a unique parking analysis tool, Park+, which is intended to allow the City to measure how changes in land use, parking, trip distribution, parking price, and management strategies affect the demands of parking. The following section describes the Park+ modeling application for the Downtown Durham area.

Introduction

The Park+ Model is largely modeled after traditional supply and demand evaluations, which includes a multi-step process for evaluating parking demand conditions for a development, community, or campus. The multi-step process typically includes gathering data, defining assumptions or characteristics, selecting generation rates, applying reduction factors, creating scenarios, and evaluating results.

The Park+ Model allows the user to consolidate gathered data, define assumptions and characteristics through a user friendly interface, develop unique generation factors through the Park+ Proximity Parking Approach, apply reduction factors related to multi-modal and demand management assumptions, create and run scenarios using the model's predictive gravity modeling algorithm, and evaluate the results on multiple levels using Park+ selection sets that can drill down from the study area level to a specific block, node, or intersection.

The Park+ Model is built on the principle of proximity parking, which assumes that parking demands are generally handled within a specific walking radius (as defined by the individual user) of a demand generator. This methodology is founded on the relationship between walking distance, price, attractiveness of facility, and general user decision making. The result of this methodology is localized parking generation rates that are predictive of actual demand conditions, which are representative of realistic parking generation characteristics for individual land uses throughout the specified study area.

This principle of proximity parking is used in both the initial calibration process as well as the predictive allocation process, which defines how many people need to park and where they want park. While the general methodology of the Park+ Model follows traditional shared use parking generation concepts, it differs from how generation rates are calculated.

The Park+ Model includes a predictive gravity demand modeling algorithm that allocates projected parking demand to adjacent parking facilities based on walking distance, price, and general attractiveness of each facility. The gravity modeling algorithm used in this model was developed specifically for the applications found in Park+. The algorithm uses the range of walking distances, price, and facility types in the model to define localized scores related to each facility and land use pair. These scores are then used to define the percentage of parking demand allocated to each parking facility, up to a user specified maximum occupancy percentage, which is defined as one of the user inputs to reflect the perceived effective capacity conditions within each Park+ community or campus.

The outputs of the Park+ Model include parking demand, parking supply, general surplus or deficit, met demand, latent (unmet) demand, and traditional parking demand required. The parking demand metric is a summary of the demand generated for the entire study area (or for the selection area). The parking supply metric is a summary of the parking capacity for the entire study area (or the selection area). The surplus or deficit metric is simply the difference between the demand and supply metrics for the given area. The met demand metric describes the amount of parking demand that is actually allocated using the proximity parking methodology, within the study area or for a given selection area. The latent demand represents the amount of demand that is not met within each localized walking radius defined within the model. While the overall supply and demand may be met within a given scenario, there may still be localized deficiencies within specific areas of the model – latent demand captures and identifies these areas.

The outputs from Park+ can be evaluated for the entire study area or for a smaller subset, which can define localized demands at the zone, block, node, or intersection level. The benefit of this analysis tool is that it allows the Park+ Model to be free from zonal boundaries, allowing the user to define analysis areas as various development plans or master planned scenarios are evaluated.

Study Area

The study area for the Downtown Durham Park+ modeling efforts is shown below. The model includes the core downtown areas, including the Downtown Loop and City Center, American Tobacco, Brightleaf Square, Central Park, as well as fringe and surrounding areas. The study area includes³:

- 1,018 apartment units
- 760,000 square feet of retail space
- 3,260,000 square feet of office space (general, government, and medical)
- 15,581 parking spaces, including 1,505 on-street and 14,076 off-street spaces (approximately 51% are privately owned and offer limited public use)

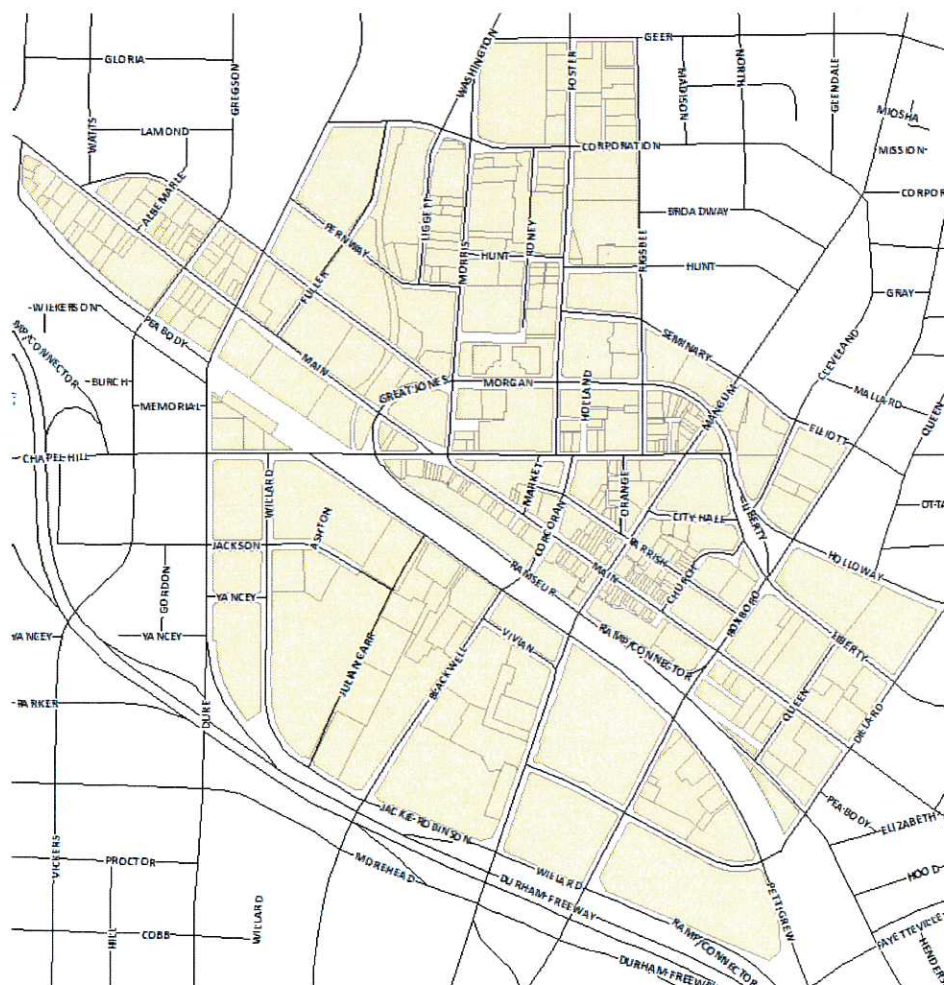


Figure 5.1 – Park+ Demand Analysis Study Area

³ Land use information was derived from City of Durham parcel information, provided by the City. The parcel information includes land use category, square footage, dwelling units, and other descriptive information. Vacant buildings and parcels are indicated in the ArcGIS data and help to define actual vacancy and utilization patterns within the study area. The only modifications made to the existing parcel shapefile were the inclusion of the Diamond View III office and mixed use complex and verification of total apartment dwelling units. Parking inventory was based on field collected data.

Calibration Settings

The Park+ Calibration process utilizes existing parking demands (collected by the project team) to calibrate parking generation rates for each individual land use within the study area. The result is a more accurate depiction of parking generation characteristics for the study area, rather than depending on city/county code or outdated national parking generation rates reported by the Institute of Transportation Engineers (ITE) or the Urban Land Institute (ULI). The Calibration process uses the previously described parking occupancy data, land use characteristics, multi-modal characteristics, public-private parking relationships, and area specific walking tolerances to define the adjusted generation rates. The Downtown Durham specific inputs are as follows:

Peak Time Inputs

The following graphic provides the time-of-day specific multi-modal inputs, which were taken directly from the data collected in the field as part of the larger study. Based on the data collected, the peak hour for parking demands in the Downtown study area is 2:00 PM, which is consistent with a downtown setting with a high density of office space.

Park+ 11.5

Scenarios

New Copy Baseline Delete

Durham Downtown Calibration

Done

Scenario: Durham Downtown Calibration

Time

The calibrated occupancy values and statistics will be displayed for the peak hour if there is no occupancy data for the hour selected below.

Peak Hour = 2 PM

Time Of Day
2 PM

Analysis Period
☒ Weekday
☐ Weekend

Home Time Multi-Modal Tools New Development Special Events Statistics

Multi-Modal Inputs

The following graphic provides the model specific multi-modal inputs, which were pulled from 2010 U.S. Census data. In the absence of more specific information, the census data was applied to all user types within the study area.

Park+ 11.2

Scenarios

New Copy Baseline Delete

Durham Downtown Calibration

Done

Scenario: Durham Downtown Calibration

Multi-Modal

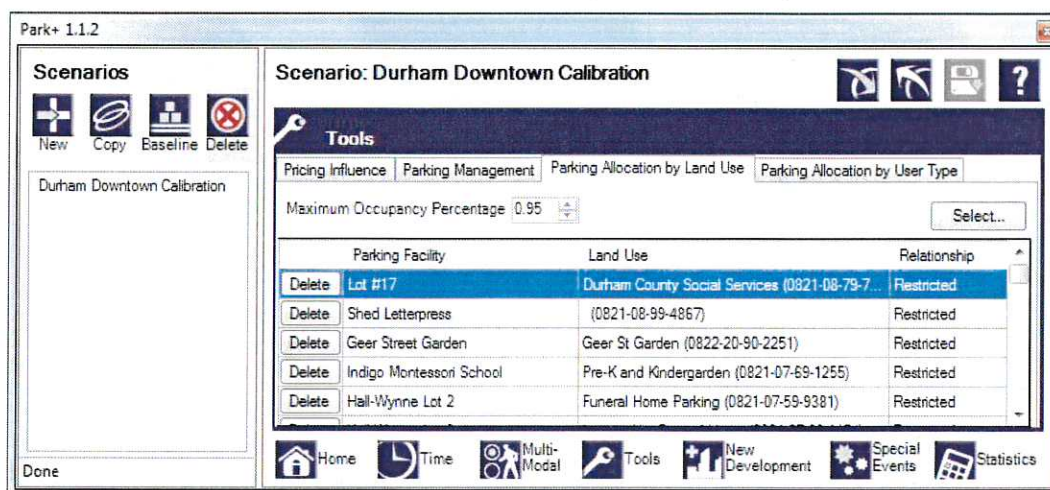
Specify the scenario's percentage of transportation modes.

| Mode | Employees % | Residents % | Visitors % | General % |
|------------|-------------|-------------|------------|-----------|
| Biking | 4 | 4 | 4 | 4 |
| Walking | 3 | 3 | 3 | 3 |
| Bus | 4 | 4 | 4 | 4 |
| Shuttle | 0 | 0 | 0 | 0 |
| Light Rail | 0 | 0 | 0 | 0 |
| Other | 5 | 5 | 5 | 5 |

Home Time Multi-Modal Tools New Development Special Events Statistics

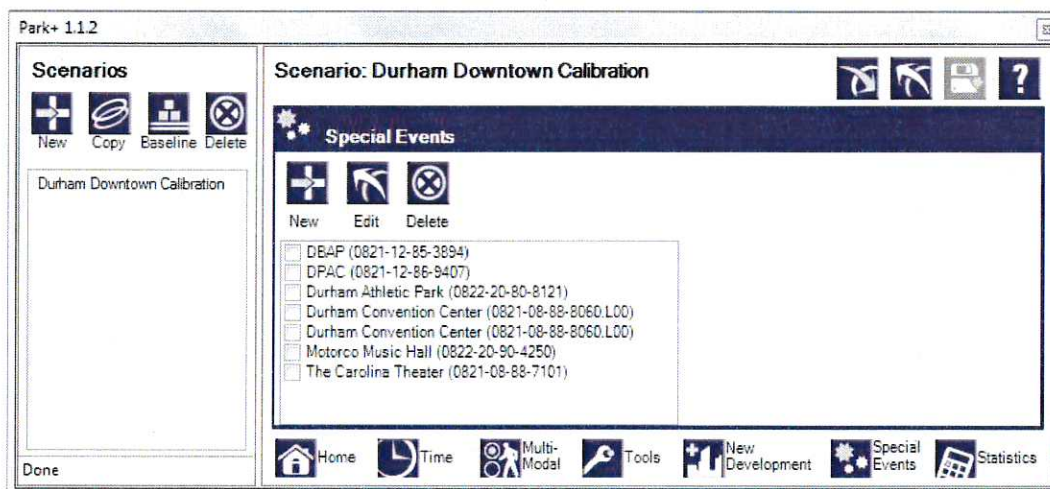
Public-Private Relationships

The following graphic provides a representation of some of the public-private parking relationships implemented in the model calibration process. These relationships represent parking that is provided solely for the benefit of a singular or small set of land uses. These specific relationships restrict the use of the parking spaces in the selected facilities to the associated land uses and their predicted demand. By setting these relationships, the model can accurately relate observed parking demands to specific uses in the study area, creating more realistic parking generation calculations during the calibration process.



Special Events

The following graphic provides a representation of the special event scenarios present in the Downtown Durham model. The special events represent existing large demand generators that occur only during special event periods. The Park+ user also has the ability to define new special events, such as parades or street festivals. The Park+ user can also evaluate combinations of events by selecting one or more of the event types below. While these events don't specifically affect the calibration process, they can be used to evaluate alternative scenarios or demand patterns.



Walking Tolerances

The walking tolerances within the model represent how far a parker is willing to walk from their parking space to their destination. The Park+ model defines walking tolerances for several user types, including residents, employees, visitors, and general users. The graphic to the right provides the Downtown Durham specific walking tolerances, which are based on discussions of the area with project stakeholders and a general understanding of the area user characteristics.

Calibration Results

Based on the inputs described in the previous section, the following results were developed for the Park+ calibration process:

Baseline Scenario

Enter values for the walking tolerances and click Calibrate to set the scenario as a baseline.

| User Type | Walking Tolerance (ft) | Walking Tolerance (min) |
|-----------|------------------------|-------------------------|
| Residents | 1200 | 5 |
| Employees | 800 | 3.33 |
| Visitors | 500 | 2.08 |
| General | 600 | 2.5 |

Calibrate

Cancel

Park+ 115

Scenarios

New

Copy

Baseline

Delete

Durham Downtown Calibration

Done

Scenario: Durham Downtown Calibration

Statistics

General

Chart

Run

Click to choose a smaller demand analysis area

Demand

Proximity Based (in spaces)

Demand

7,946

Supply

15,581

Surplus/Deficit

7,635

Traditional Demand Calculation

When evaluating the parking demands in this area, the single use parking demands would be

20,505

Home

Time

Multi-Model

Tools

New Development

Special Events

Statistics

These results indicate that there is a 7,946 space demand for parking versus a 15,581 space supply within the study area, indicating that the study area is operating at approximately 51 percent of total supply. Additionally, the output indicates that the latent demand is -38 spaces, meaning that the study area isn't able to meet all of the demand for parking within the walking tolerances selected by the user of the model (*this is a result of combined allocations between facilities and the observed demand in the peak hour and is common for a model of this size*). Finally, the model indicates that the demand for parking when using traditional demand metrics is 20,505 spaces, meaning that the actual demand is approximately 60 percent less than demand predicted by traditional measures (in this case ITE or ULI).

Figure 5.2 shows the actual occupancy of each of the parking facilities within the study area at the approximate peak hour at 2:00 PM. This should closely resemble the data collection results because that data was used as the baseline for calibration.

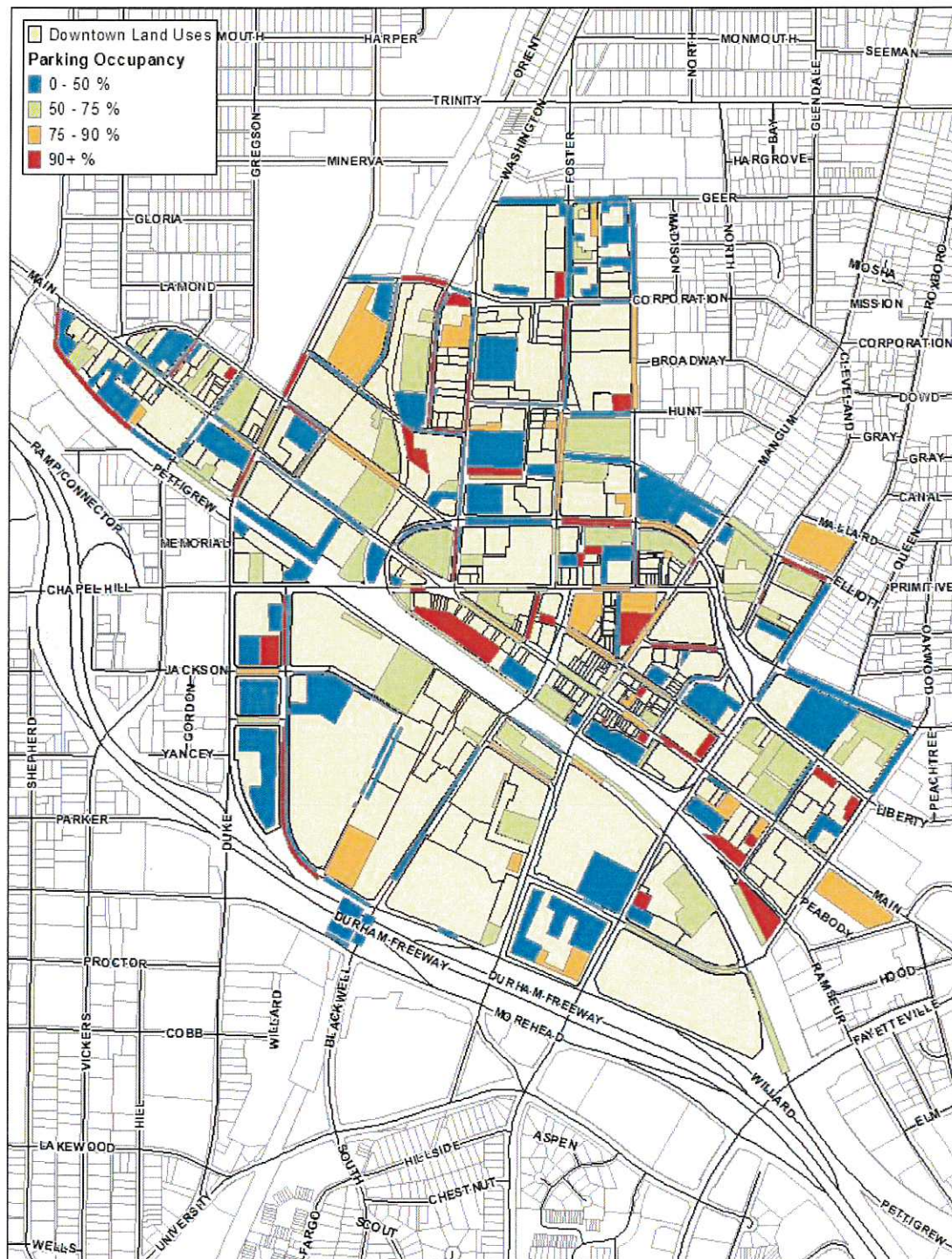


Figure 5.2 – Park+ Calibrated Parking & Land Use Dataset
(2:00 PM, approximate peak hour)

Calibrated Parking Generation Rates

One of the key outputs of the calibration process is the development of location specific parking generation rates for each land use (and consolidated land use category). Table 5.1 provides a summation of the initial weekday parking generation rates for the Downtown Durham area⁴.

Table 5.1 – Downtown Calibrated Parking Generation Rates

| Land Use Category | Minimum Generation Rate | Units | Maximum Generation Rate | Average Generation Rate | Traditional Generation Rate ⁵ |
|-------------------|-------------------------|-----------------|-------------------------|-------------------------|--|
| Apartments | 0.37 | spaces/unit | 1.41 | 0.81 | 1.61 |
| Auto Service | 1.01 | spaces/1,000 SF | 6.70 | 2.58 | 4.17 |
| Bank | 0.71 | spaces/1,000 SF | 3.96 | 1.56 | 2.64 |
| Church | 0.28 | spaces/1,000 SF | 4.52 | 1.75 | 1.17 |
| Government Office | 0.25 | spaces/1,000 SF | 10.29 | 2.75 | 4.20 |
| Lounge | 1.77 | spaces/1,000 SF | 15.71 | 4.78 | 16.50 |
| Medical Office | 2.21 | spaces/1,000 SF | 4.38 | 3.01 | 4.50 |
| Office | 0.18 | spaces/1,000 SF | 14.58 | 1.77 | 3.50 |
| Restaurant | 1.53 | spaces/1,000 SF | 14.00 | 6.83 | 18.00 |
| Retail | 0.10 | spaces/1,000 SF | 9.41 | 0.98 | 2.13 |
| Warehouse | 0.15 | spaces/1,000 SF | 1.00 | 0.51 | 0.81 |

Projection Characteristics and Results

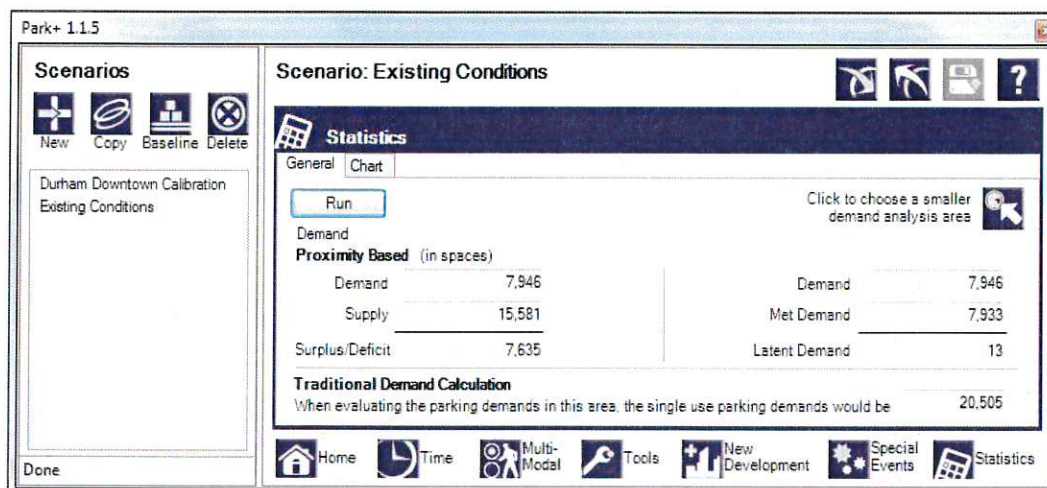
In addition to the calibration settings, the Park+ model is able to run projected conditions for the existing scenario, as well as additional scenarios. The projected conditions differ from calibration because they predict where parkers would prefer to park if given the choice – based on the relationship between walking distance, price, and attractiveness of parking.

Projection Results – Existing Conditions

The output below provides the initial existing conditions projection from the model. The results do not differ from the calibration process, because none of the inputs were changed.

⁴ The initial parking generation rates are based on the parking data collected as part of this study. The City should assimilate several iterations of data for a statistically significant sample size prior to incorporating these design characteristics into ordinance or governing documents.

⁵ Traditional generation rate is based on either ITE Parking Generation Manual, 4th Edition, or ULI Shared Parking Manual



Just as in the calibration condition, the results indicate that there is a 7,946 space demand for parking versus a 15,581 space supply within the study area. However, unlike the calibration setting which is based on observed demands, projected parking demands were allocated based on the Park+ principles of proximity parking, using price, distance, and attractiveness to determine the overall allocation of parking. This change in operation results in a different geographic distribution of parking (within the parameters of the public-private relationships we originally set up) and the creation of a new category of latent demand.

For this scenario, the output indicates that the latent demand is 13 spaces, meaning that there are a handful of spaces of parking demand that are not able to be allocated. In this instance, the value is likely due to incremental demand that is generated by land uses and then rounded for presentation purposes in the interface above. As shown in Figure 5.3, there are no specific land uses with latent demand attributed to them.

Finally, the model indicates that the demand for parking when using traditional demand metrics is 20,505 spaces, meaning that the actual demand is approximately 60 percent less than demand predicted by traditional measures (in this case ITE or ULI).

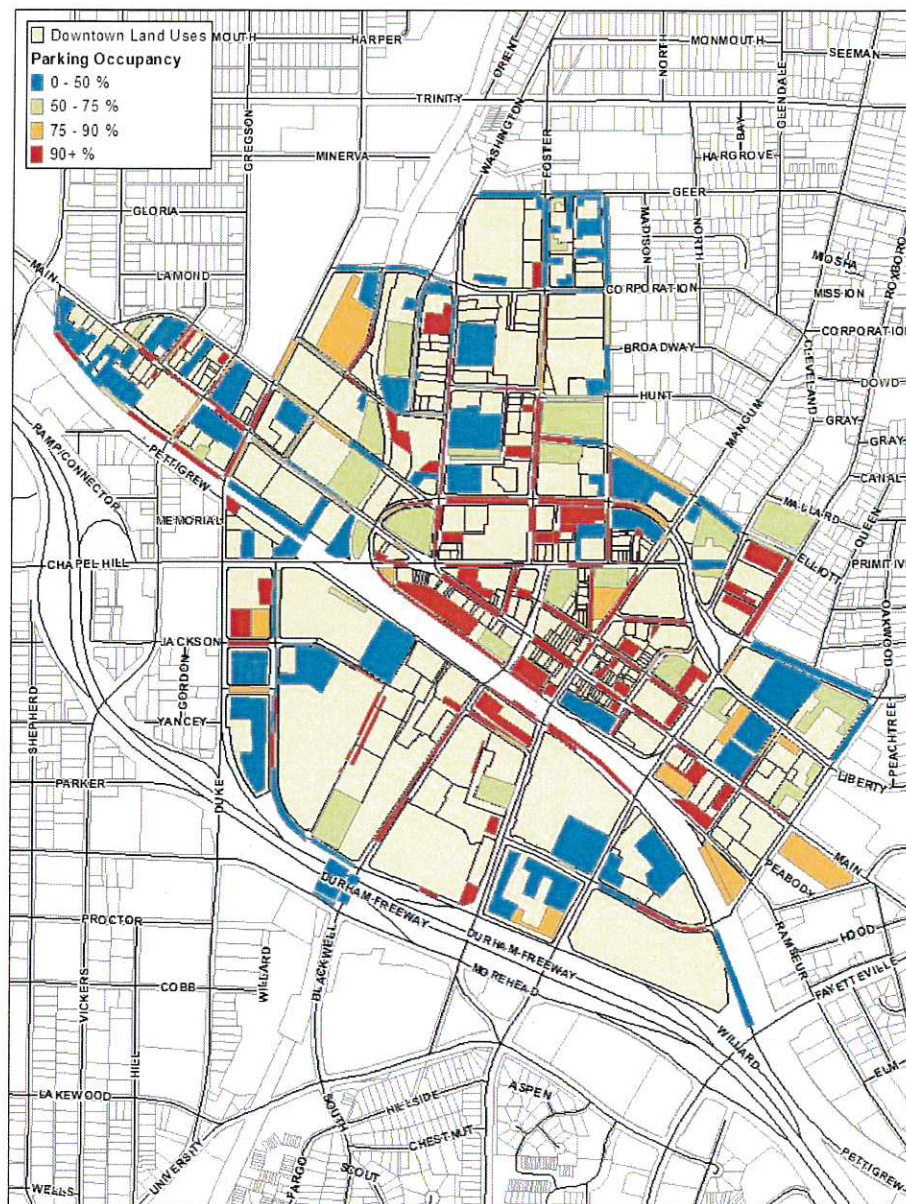
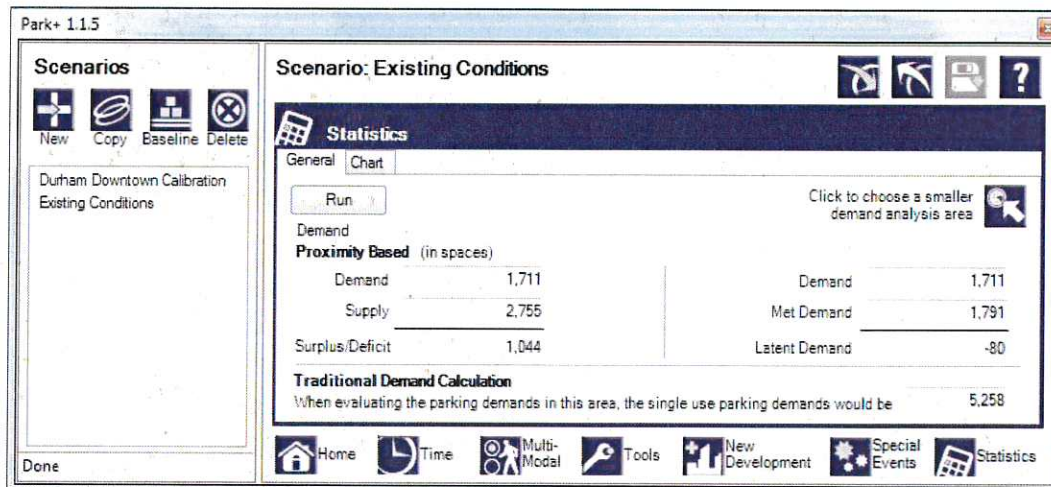


Figure 5.3 – Park+ Existing Scenario Demand Projections
(2:00 PM, approximate peak hour)

The parking demands projected in the previous scenario are for the full downtown study area. The Park+ model also has the capability to drill down to specific subsets within the study area, allowing the user to better understand parking demands on a localized level. The following two sections look at existing parking conditions within two of the more prominent areas in Durham, the Downtown Loop and American Tobacco.

Projected Conditions – Downtown Loop

The output below shows the specific selection area for the Downtown Loop subset. This selection area includes everything inside Morgan Street/Ramseur Street/Roxboro Street loop.



In general, the area has a 1,044 space surplus, with a total demand of 1,711 spaces versus a supply of 2,755 spaces. The 1,711 space demand represents the demand generated by the land uses within the selection boundary shown in the accompanying graphic (representing the Downtown Loop boundary). The 2,755 spaces of supply represents the physical supply of parking found within the Downtown Loop boundary.

Additionally, the latent demand results indicate that 1,791 spaces of the demand in the area is met by parking facilities within the selection area. This met demand represents the actual occupied spaces within the Downtown Loop parking facilities (the 2,755 spaces defined in the selection set). The met demand is greater than the actual demand because a number of people are utilizing the Downtown Loop parking facilities to access land uses outside of the Downtown Loop, within the user specified walking distances. The resulting value is the selection area's specific latent demand (-80 spaces), which in this case is negative because it represents parking demand that is generated outside of the selection area, within the acceptable user walking tolerances.

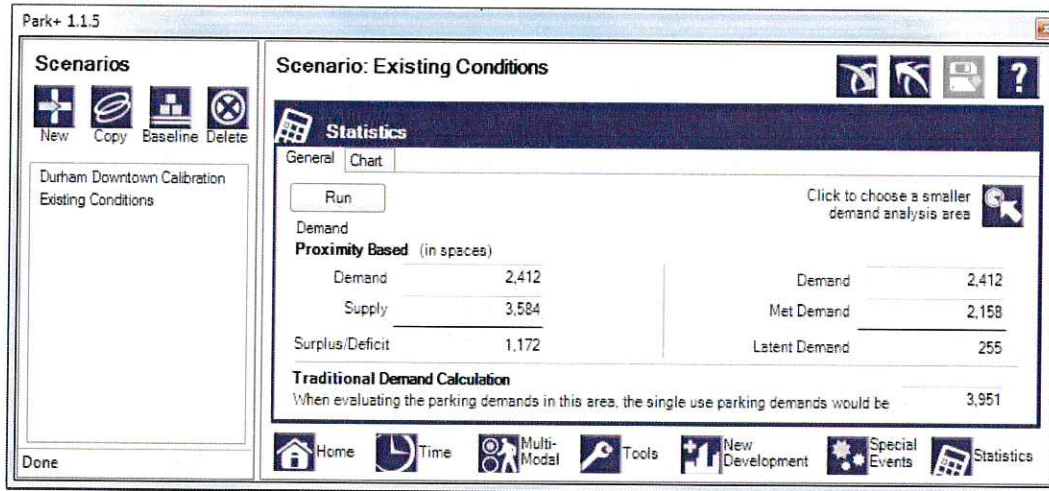
The results of this subset selection are shown in Figure 5.4.



Figure 5.4 – Park+ Existing Scenario Demand Projections – Downtown Loop
(2:00 PM, approximate peak hour)

Projected Conditions – American Tobacco

The output below shows the specific selection area for the American Tobacco subset. This selection area includes everything between Willard Street, Pettigrew Street, Mangum Street, and Jackie Robinson Drive.



In general, the area has a 1,172 space surplus, with a total demand of 2,412 spaces versus a supply of 3,584 spaces. The 2,412 space demand represents the demand generated by the land uses within the selection boundary shown in the accompanying graphic (representing the American Tobacco boundary). The 3,584 spaces of supply represents the physical supply of parking found within the American Tobacco selection boundary.

Additionally, the latent demand results indicate that 2,158 spaces of the demand in the area is met by parking facilities within the selection area. This met demand represents the actual occupied spaces within the American Tobacco parking facilities (the 3,584 spaces defined in the selection set). The met demand is less than the actual demand because a number of people that wish to park in various American Tobacco parking facilities are not able to based on defined parking restrictions and the user specified walking distances. The remaining spaces within the selection area are either reserved or are not within an acceptable walking tolerance for the demand generators. The resulting value is the selection area's specific latent demand (255 spaces), which is either met outside of the selection area, within the acceptable user walking tolerances, or not met at all.

The results of this subset selection are shown in Figure 5.5.

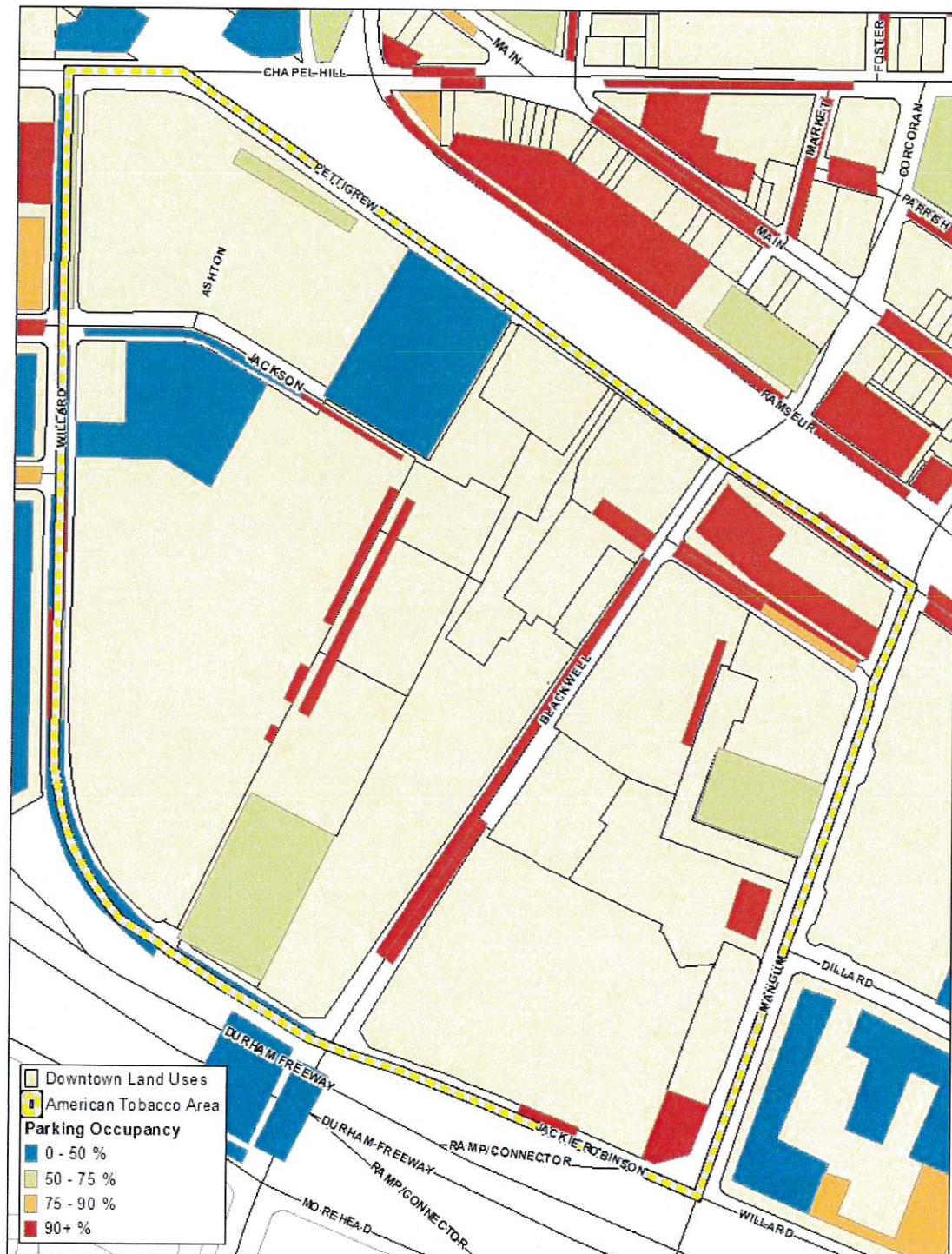


Figure 5.5 – Park+ Existing Scenario Demand Projections – American Tobacco
(2:00 PM, approximate peak hour)

Projected Conditions – Committed Projects

The next projection scenario looks at committed projects (as of October 2012) that are either under construction now or plan to be under construction within the next year in Downtown Durham. The specific projects are listed below and shown in Figure 5.6.

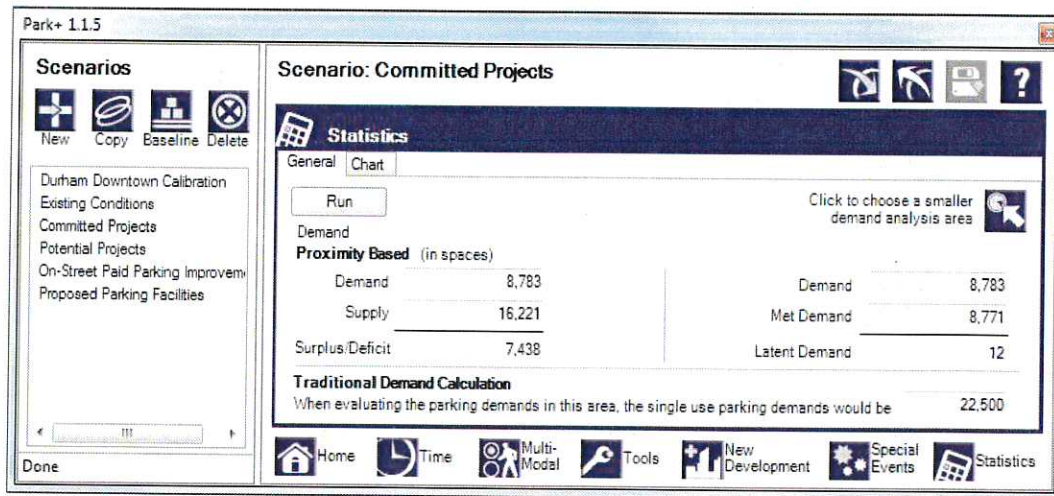
1. 21(c)Hotel – 125 room hotel with 8,000 square feet ground floor retail and 8,000 square feet restaurant
2. 315 E Chapel Hill – 64 room boutique hotel with 8,000 square feet ground floor retail
3. Federal Capital Partners Apartments – 190 apartments
4. New Duke Warehouses – 150,000 square feet office and lab space, maintaining the 308 on-site parking spaces
5. Greenfire/Armada Hoffler Apartments – 183 apartments and 185 parking spaces
6. Woolworth's Site – 80 apartments with 50,000 square feet office and 20,000 square feet retail, with 200 parking spaces on-site
7. Morris Ridge Development – mixture of 230,000 square feet office, 25,000 square feet retail, and 250 apartments with 606 space parking structure

The projects also represent a reduction in 459 parking spaces throughout the study area, based on new developments at the Federal Capital, Greenfire/Armada Hoffler, and Morris Ridge sites replacing surface parking. Parking spaces (additional supply) were added for numbers 4, 5, 6, and 7 above, as noted in their descriptions.



Figure 5.6 – Committed Projects

The results for the committed projects analysis are shown on the following pages.



The results indicate that there is a 8,783 space demand for parking versus a 16,221 space supply within the study area in the "Committed Projects" scenario. The total demand represents the demand generated by all land uses, including the existing land uses and the committed projects defined on the previous pages. The total supply represents the entirety of the parking spaces found within Downtown Durham, including the existing spaces and those new spaces associated with new development.

For this scenario, the output indicates that the latent demand is 12 spaces, which is similar to the results defined in the existing conditions scenarios. The small amount of latent demand are largely caused by rounding calculations that are common for a model this size. Based on the results, the new developments can be accommodated by the adjacent parking facilities – but that is not to say that they should not have some level of parking made available on site. A detailed analysis for those uses provides the following results:

1. 21(c)Hotel – 122 spaces of demand in the peak hour, supported by adjacent parking
2. 315 E Chapel Hill – 35 spaces of demand in the peak hour, supported by adjacent parking
3. Federal Capital Partners Apartments – 104 spaces of demand in the peak hour
4. New Duke Warehouses – 181 spaces of demand housed on-site in the peak hour
5. Greenfire/Armada Hoffler Apartments – 101 spaces of demand housed on-site in the peak hour
6. Woolworth's Site 135 spaces of demand housed on-site in the peak hour
7. Morris Ridge Development – 500 spaces of demand housed on-site in the peak hour

Finally, the model indicates that the demand for parking when using traditional demand metrics is 22,500 spaces, meaning that the actual demand is approximately 60 percent less than demand predicted by traditional measures (in this case ITE or ULI).

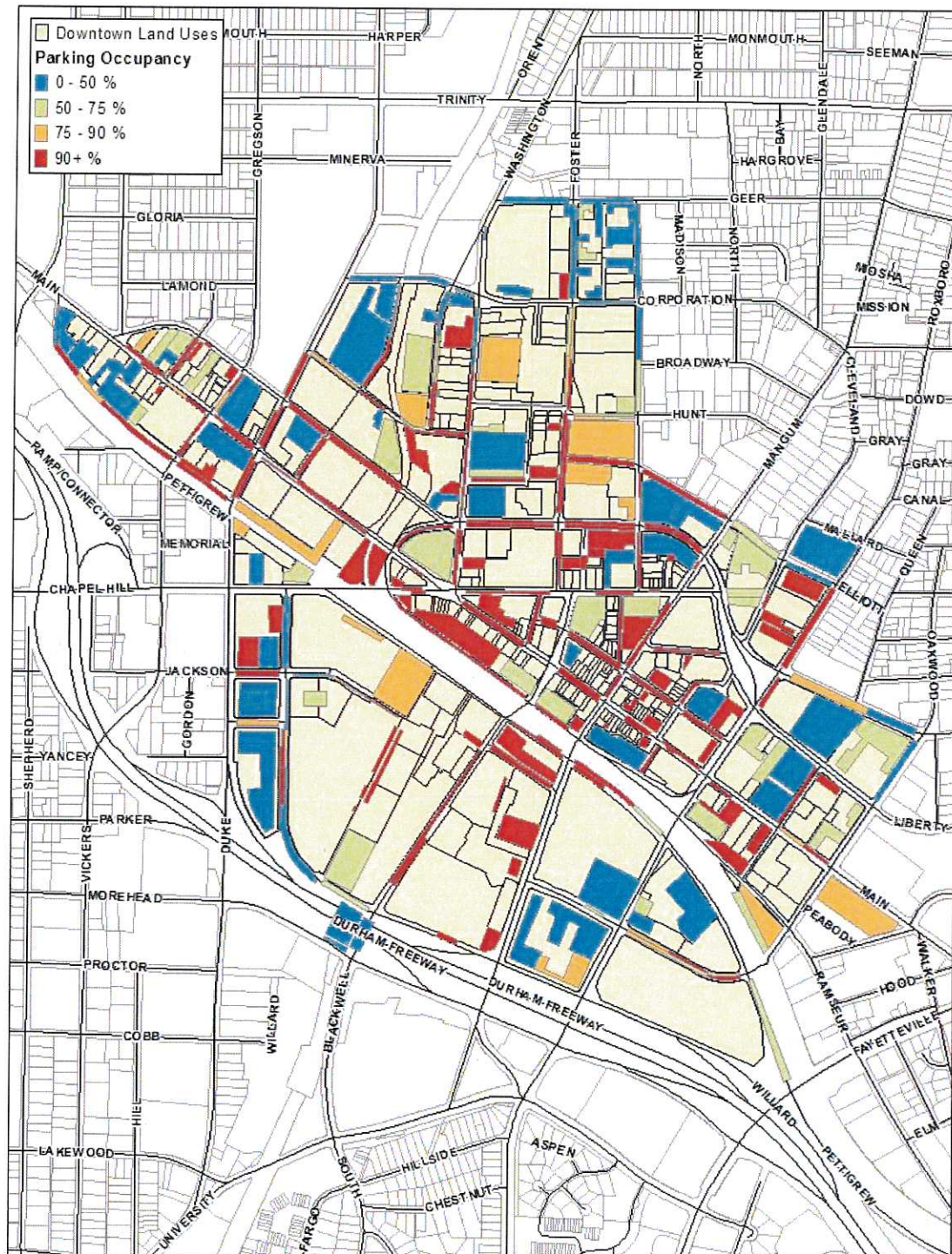
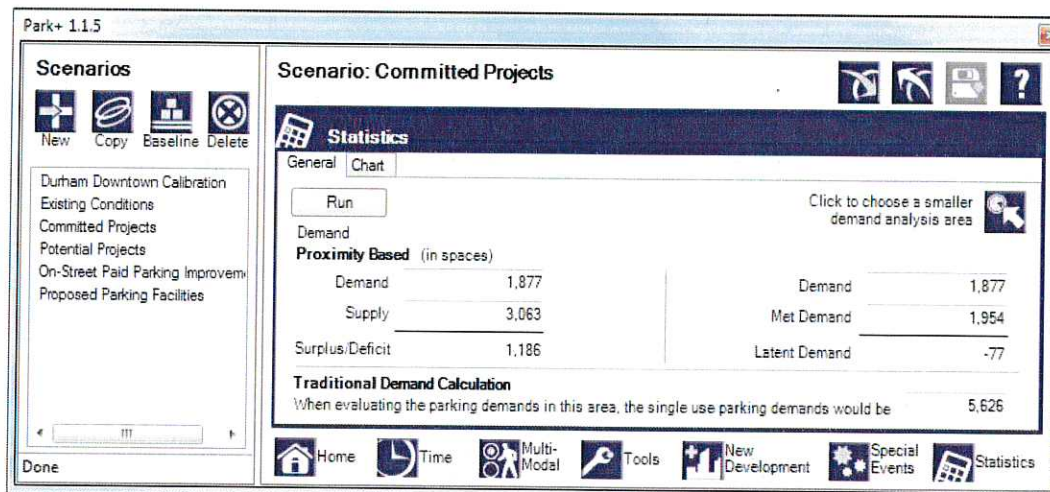


Figure 5.7 – Park+ Committed Projects Demand Projections
(2:00 PM, approximate peak hour)

Downtown Loop – Committed Projects



In general, the Downtown Loop area has a 1,186 space surplus, with a total demand of 1,877 spaces versus a supply of 3,063 spaces. The 1,877 space demand represents the demand generated by the land uses within the selection boundary shown in the accompanying graphic (representing the Downtown Loop boundary). The 3,063 spaces of supply represents the physical supply of parking found within the Downtown Loop boundary.

Additionally, the latent demand results indicate that there is a total met demand in the area of 1,954 spaces. This met demand represents the actual occupied spaces within the Downtown Loop parking facilities (the 3,063 spaces defined in the selection set). The met demand is greater than the actual demand because a number of people are utilizing the Downtown Loop parking facilities to access land uses outside of the Downtown Loop, within the user specified walking distances. This result means that 77 spaces of demand in the area come from outside of the selection area because of adjacent demand issues, affected by the new land uses from the committed projects.

The results of this subset selection are shown in Figure 5.8.

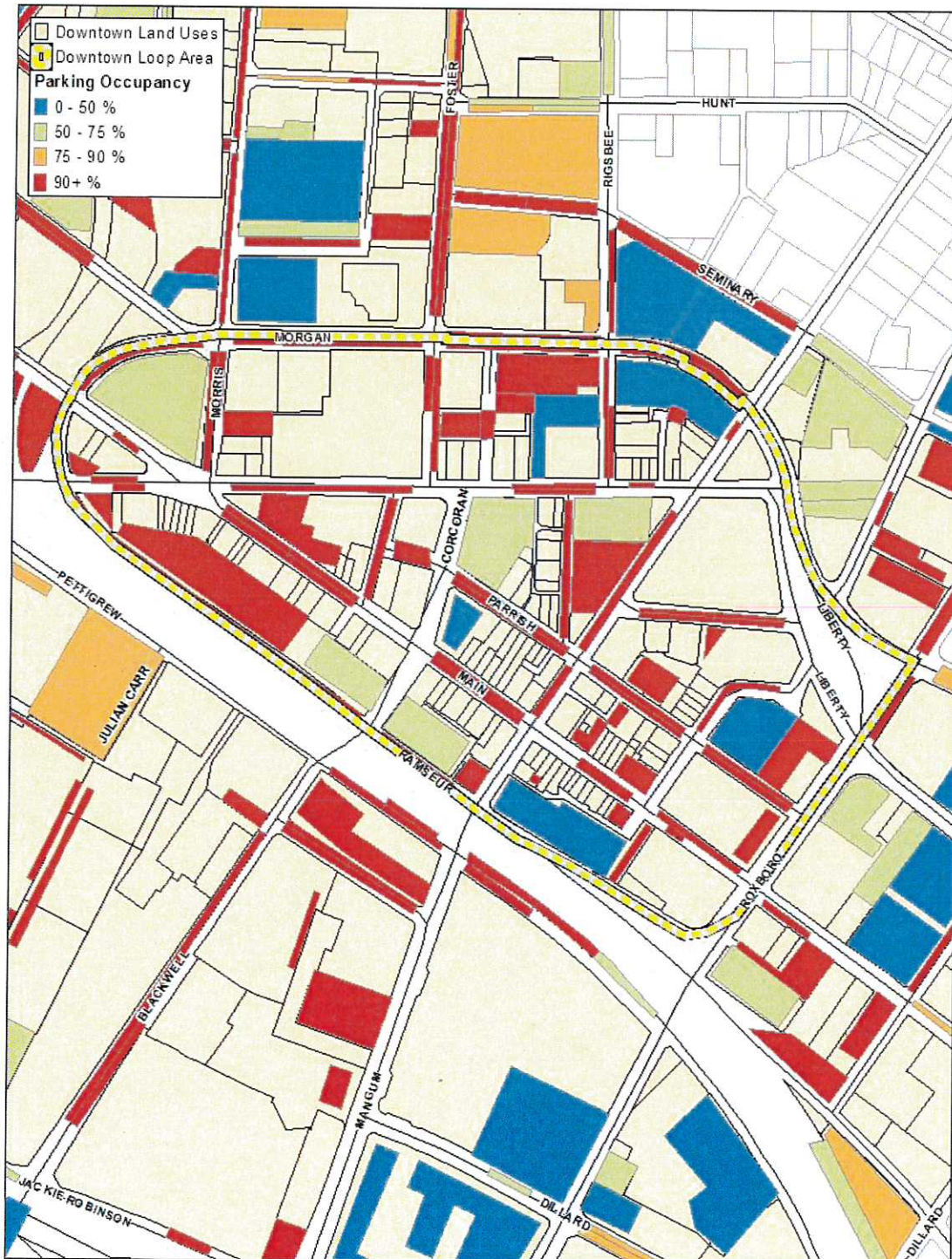
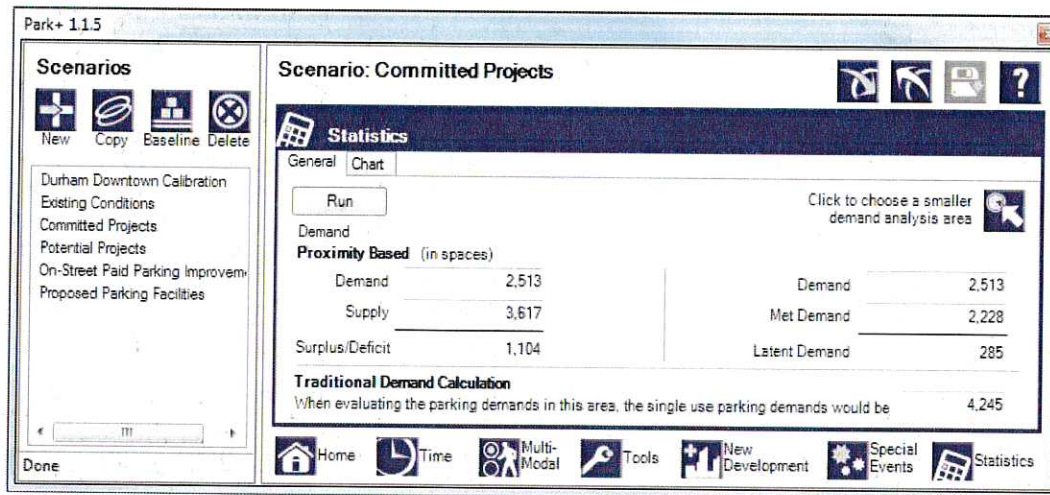


Figure 5.8 – Park+ Committed Projects Demand Projections – Downtown Loop
(2:00 PM, approximate peak hour)

American Tobacco – Committed Projects



In general, the American Tobacco area has a 1,104 space surplus, with a total demand of 2,513 spaces versus a supply of 3,617 spaces. The 2,513 space demand represents the demand generated by the land uses within the selection boundary shown in the accompanying graphic (representing the American Tobacco boundary). The 3,617 spaces of supply represents the physical supply of parking found within the American Tobacco selection boundary, including parking supply changes based on the committed projects.

Additionally, the latent demand results indicate that 2,228 spaces of the demand in the area is met by parking facilities within the selection area. This met demand represents the actual occupied spaces within the American Tobacco parking facilities (the 3,617 spaces defined in the selection set). The met demand is less than the actual demand because a number of people that wish to park in various American Tobacco parking facilities are not able to based on defined parking restrictions and the user specified walking distances. The remaining spaces within the selection area are either reserved or are not within an acceptable walking tolerance for the demand generators. The resulting value is the selection area's specific latent demand (285 spaces), which is either met outside of the selection area, within the acceptable user walking tolerances, or not met at all.

The results of this subset selection are shown in Figure 5.9.

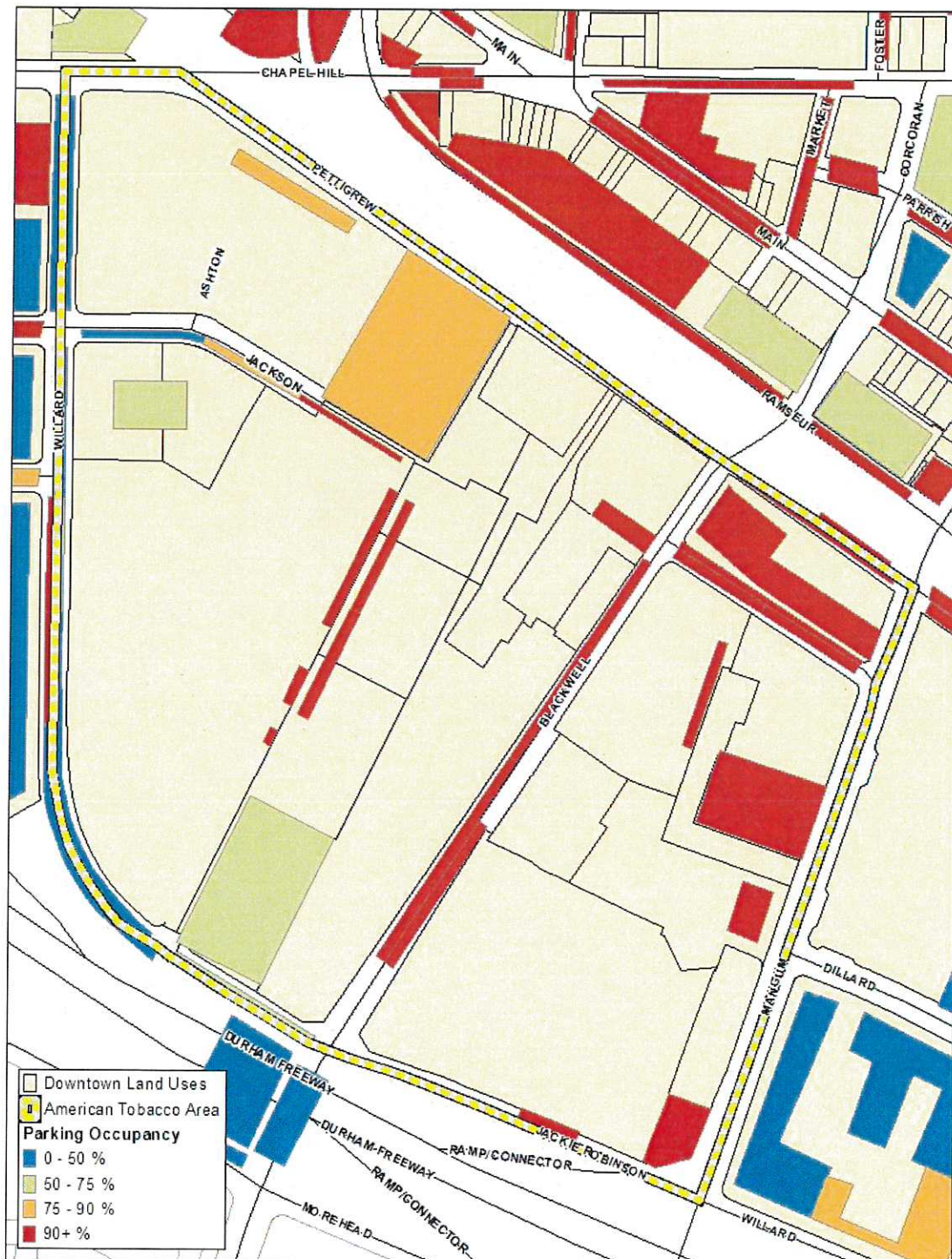


Figure 5.9 – Park+ Committed Projects Demand Projections – American Tobacco
(2:00 PM, approximate peak hour)

Projected Conditions – Potential Projects

The next scenario looks at potential projects (as of October 2012) that could occur in Downtown Durham during the planning horizon for this study. The specific projects are listed below and shown in Figure 5.10.

1. Sturdivant Properties – mixture of 150 hotel rooms, 200 apartments, and 300,000 square feet office
2. Citizens National – mixture of 2,500 square feet retail and 3 apartment units
3. Lot #14 Redevelopment – 112,000 square feet retail uses
4. Denny Clark site – mixture of 25,000 square feet retail and 80 apartments
5. Liberty Warehouse – mixture of 51,000 square feet retail and 60 apartments
6. Craig Davis Foster Street Lot Redevelopment – mixture of 95,000 square feet retail uses
7. Hank Scherich Parking Lot Redevelopment – 100,000 square feet office site
8. Chesterfield Building – 250,000 square feet office site
9. Cherokee/TTA site – 56,000 square feet retail uses
10. Durham Station Development – 275,000 square feet retail uses
11. University Ford Car Dealership - mixture of retail uses

The projects also represent a reduction in 925 parking spaces throughout the study area, based on several of the sites projected locations on existing surface parking. Because of the variable nature of the projects, no parking spaces were modeled with the new projects to estimate the parking demands on the downtown area. Estimates of site specific parking demand are provided in the subsequent discussion.

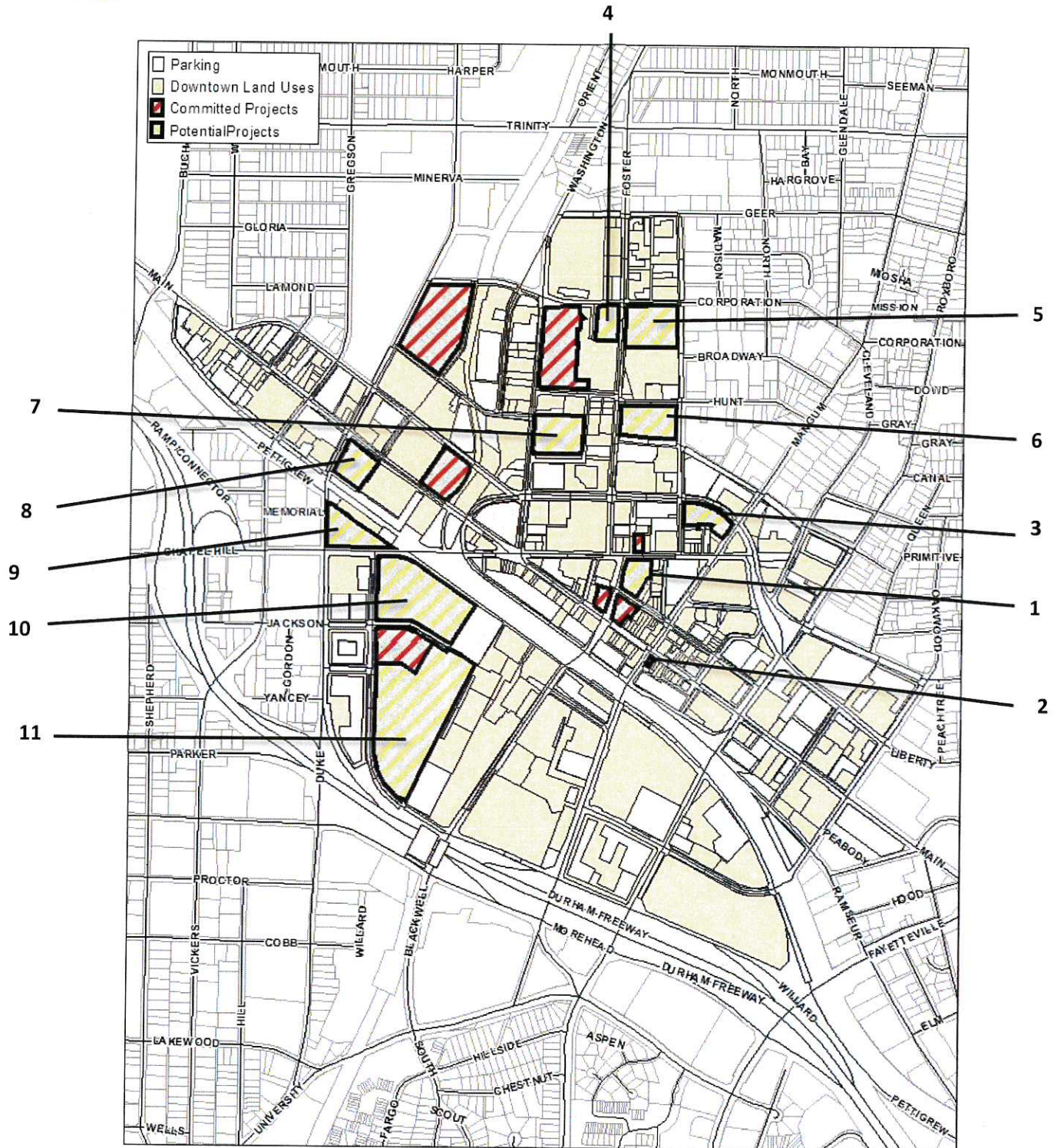
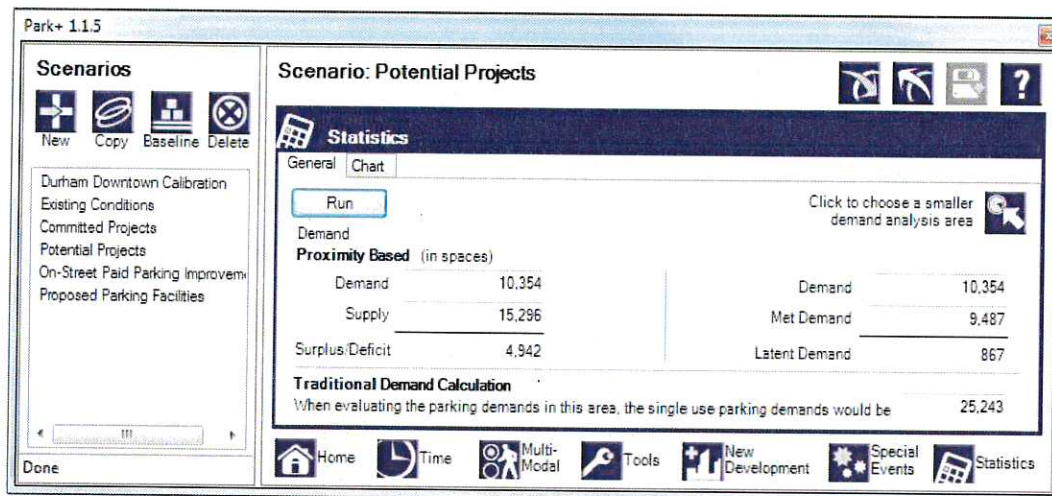


Figure 5.10 – Park+ Potential Projects

The results for the potential projects analysis are shown on the following pages.



The results for the Potential Projects scenario indicate that there is a 10,354 space demand for parking versus a 15,296 space supply within the study area. The total demand represents the demand generated by all land uses, including the existing land uses, the committed projects, and the potential projects defined on the previous pages. The total supply represents the entirety of the parking spaces found within Downtown Durham, including the existing spaces and those new spaces associated with committed development.

For this scenario, the output indicates that the latent demand is 867 spaces, which is a result of some demand tensions created by the potential new developments. The latent demand, which is created by the potential new developments without associated parking, represents demand that cannot be met within the specified walking tolerances and restriction patterns defined in the model. Current City Ordinance does not require new development to provide parking, therefore, latent demand represents estimated parking that is needed to support the potential projects.

A detailed analysis of the potential new developments provides the following projected parking needs at the approximate peak hour of 2:00 PM:

1. Sturdivant Properties – 594 spaces of demand on-site (with 139 spaces of unmet demand)
2. Citizens National – 4 spaces of demand on-site
3. Lot #14 Redevelopment – 93 spaces of demand on-site (with 10 spaces of unmet demand)
4. Denny Clark site – 65 spaces of demand on-site
5. Liberty Warehouse – 76 spaces of demand on-site (with 18 spaces of unmet demand)
6. Craig Davis Foster Street Lot Redevelopment – 82 spaces of demand on-site (61 spaces of latent demand)
7. Hank Scherich Parking Lot Redevelopment – 149 spaces of demand on-site
8. Chesterfield Building – 372 spaces of demand on-site
9. Cherokee/TTA site – 46 spaces of demand on-site
10. Durham Station Development – 226 spaces of demand on-site
11. University Ford Car Dealership – 370 spaces of demand on-site (31 spaces of latent demand)

Finally, the model indicates that the demand for parking when using traditional demand metrics is 25,243 spaces, meaning that the actual demand is approximately 60 percent less than demand predicted by traditional measures (in this case ITE or ULI).

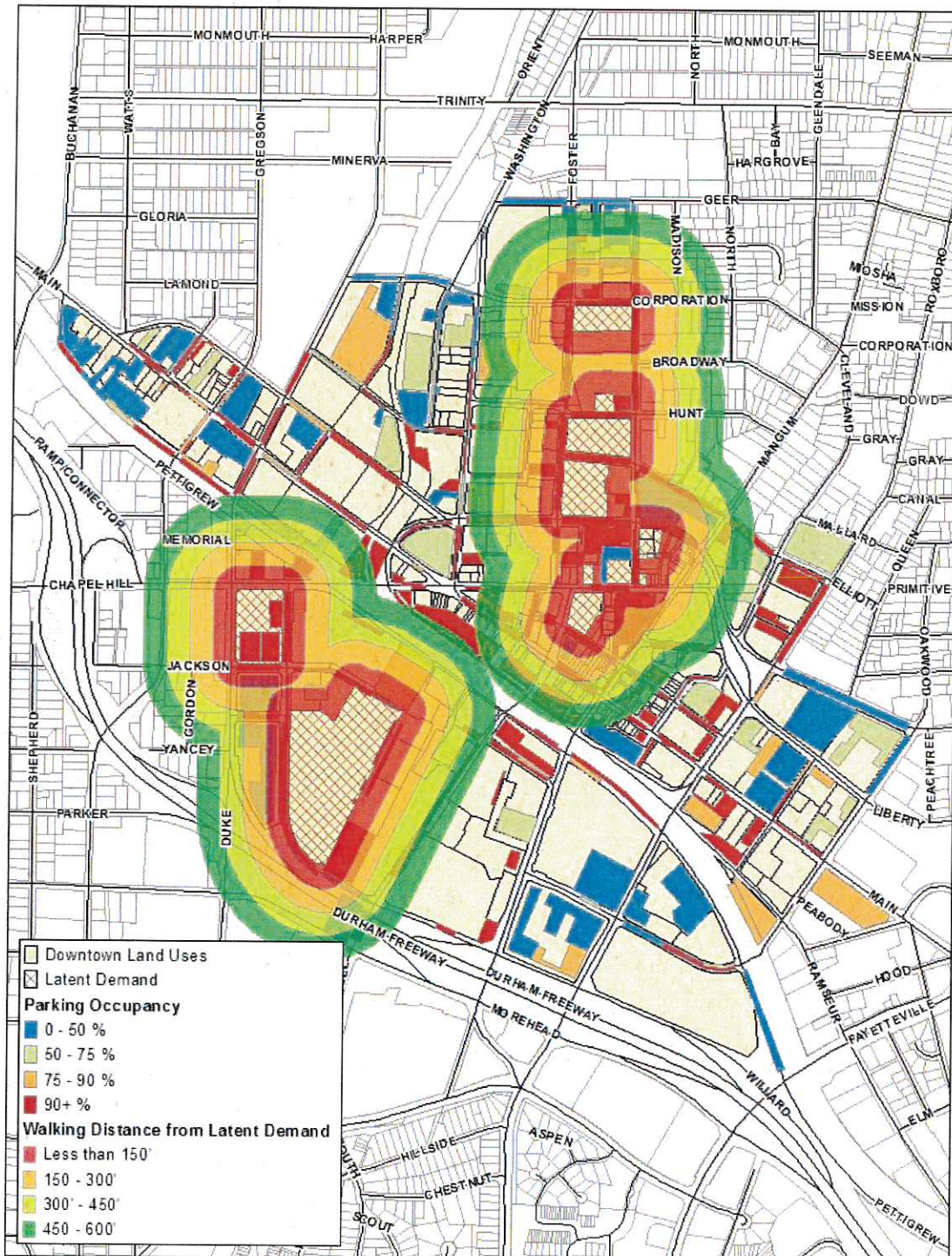
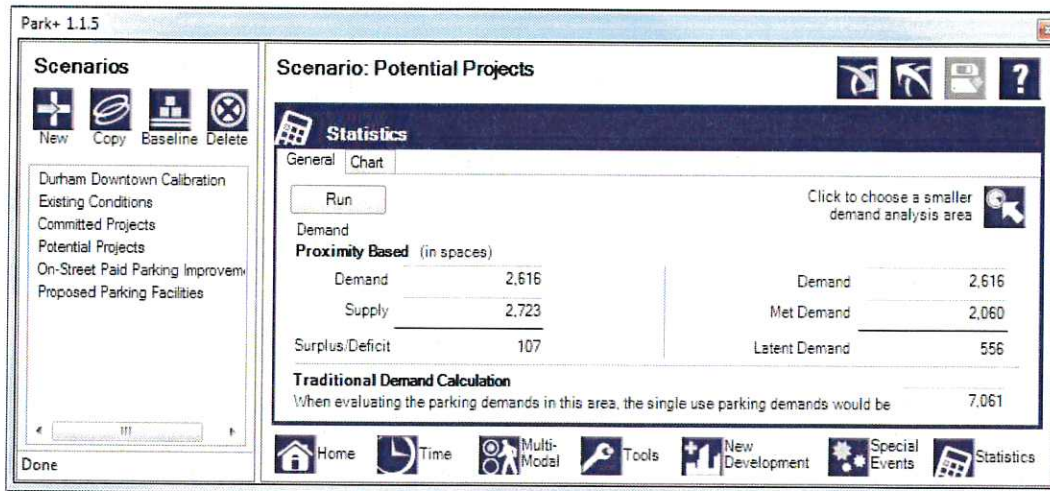


Figure 5.11 – Park+ Potential Projects Demand Projections
(2:00 PM, approximate peak hour)

Downtown Loop – Potential Projects



In the Potential Projects scenario, the Downtown Loop area has a 107 space surplus, with a total demand of 2,616 spaces versus a supply of 2,723 spaces. The 2,616 space demand represents the demand generated by the land uses within the selection boundary shown in the accompanying graphic (representing the Downtown Loop boundary). The 2,723 spaces of supply represents the physical supply of parking found within the Downtown Loop boundary.

Additionally, the latent demand results indicate that 2,060 spaces of the demand in the area is met by parking facilities within the selection area. This met demand represents the actual occupied spaces within the Downtown Loop parking facilities (the 2,723 spaces defined in the selection set). The met demand is less than the actual demand because a number of people that wish to park in various Downtown Loop parking facilities are not able to based on defined parking restrictions and the user specified walking distances. The remaining spaces within the selection area or are either reserved are not within an acceptable walking tolerance for the demand generators. The resulting value is the selection area's specific latent demand (556 spaces), which is either met outside of the selection area, within the acceptable user walking tolerances, or not met at all.

The results of this subset selection are shown in Figure 5.12.

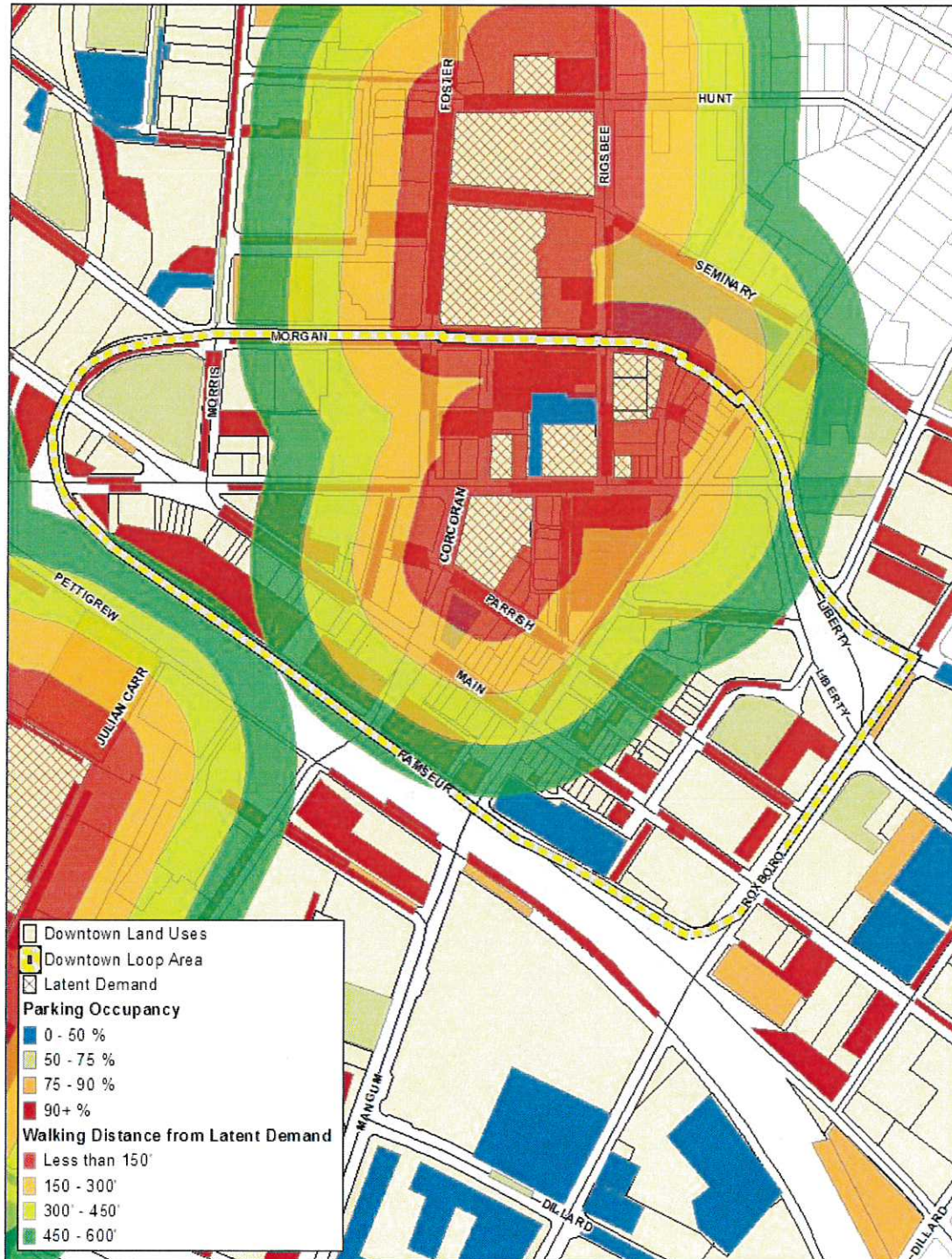
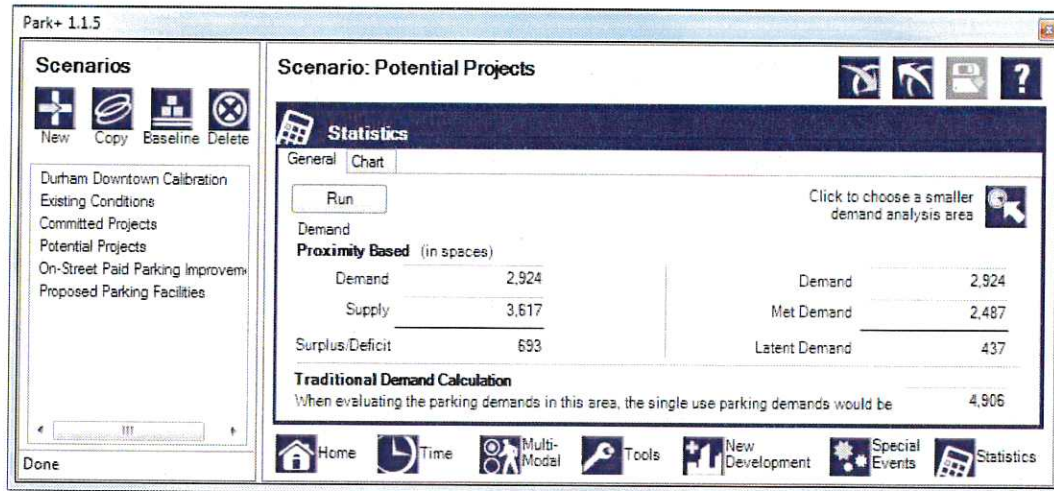


Figure 5.12 – Park+ Potential Projects Demand Projections – Downtown Loop
(2:00 PM, approximate peak hour)

American Tobacco – Potential Projects



In the Potential Projects scenario, the American Tobacco area has a 693 space surplus, with a total demand of 2,924 spaces versus a supply of 3,617 spaces. The 2,924 space demand represents the demand generated by the land uses within the selection boundary shown in the accompanying graphic (representing the American Tobacco boundary). The 3,617 spaces of supply represents the physical supply of parking found within the American Tobacco selection boundary, including parking supply changes based on the committed projects.

Additionally, the latent demand results indicate that 2,487 spaces of the demand in the area is met by parking facilities within the selection area. This met demand represents the actual occupied spaces within the American Tobacco parking facilities (the 3,617 spaces defined in the selection set). The met demand is less than the actual demand because a number of people that wish to park in various American Tobacco parking facilities are not able to based on defined parking restrictions and the user specified walking distances. The remaining spaces within the selection area are either reserved or are not within an acceptable walking tolerance for the demand generators. The resulting value is the selection area's specific latent demand (437 spaces), which is either met outside of the selection area, within the acceptable user walking tolerances, or not met at all.

The results of this subset selection are shown in Figure 5.13.

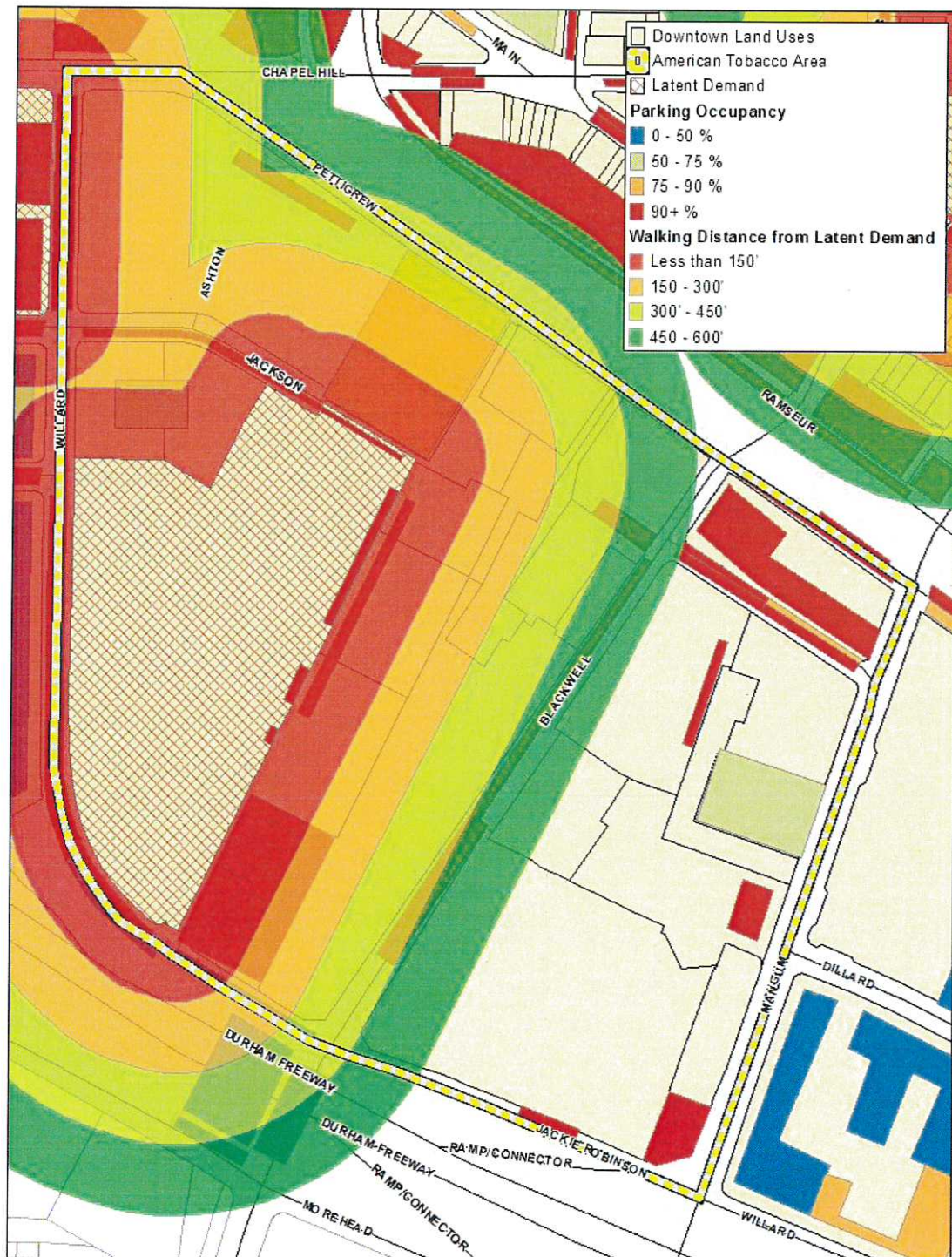


Figure 5.13 – Park+ Potential Projects Demand Projections – American Tobacco
(2:00 PM, approximate peak hour)

Projected Conditions – Paid On-Street Parking

The final two scenarios relate to parking improvements that are recommended as part of this study. The first relates to paid on-street parking, as defined in the Recommendations section of this document. Figure 5.14 provides a visual representation of the paid on-street locations.

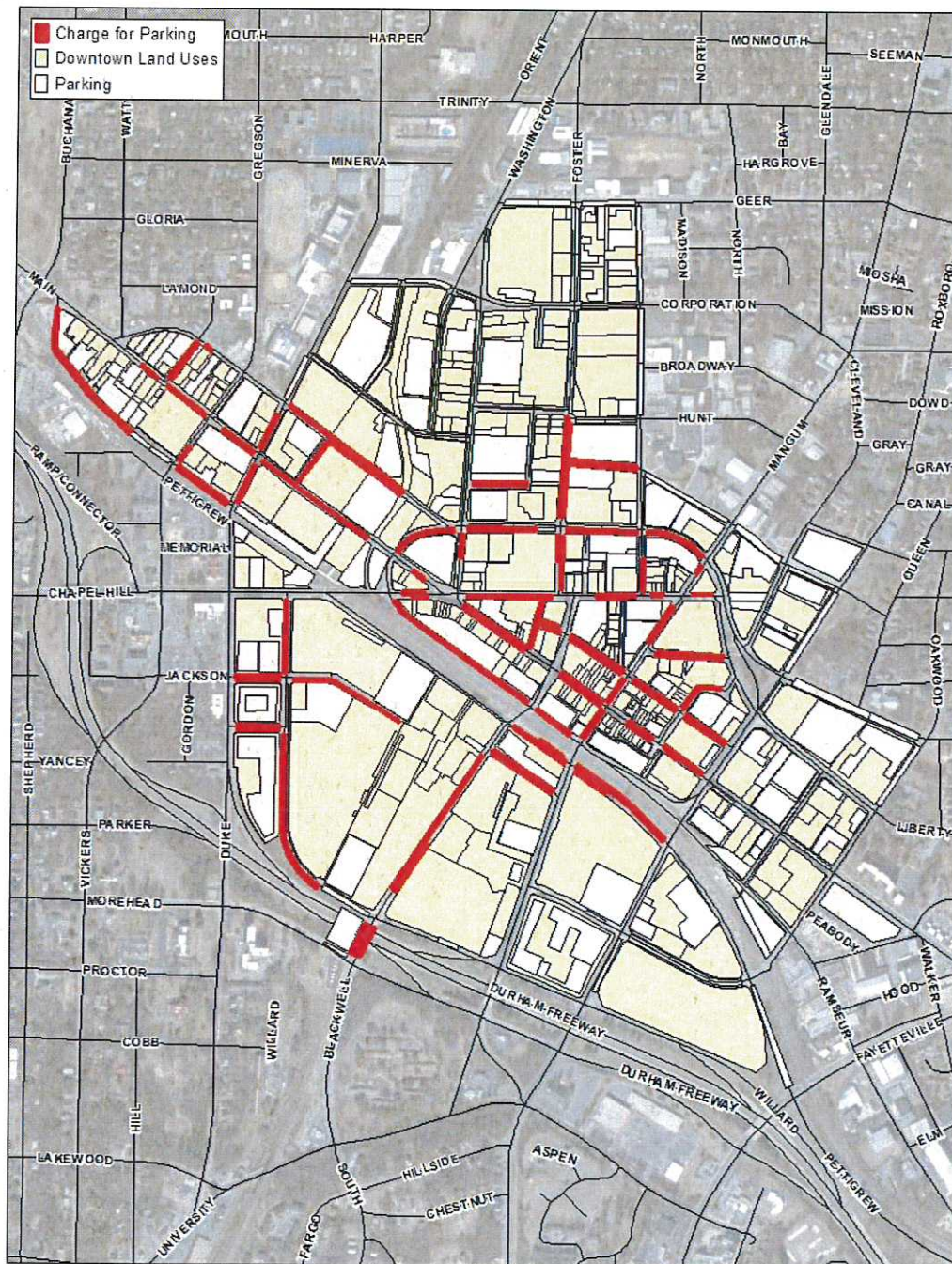
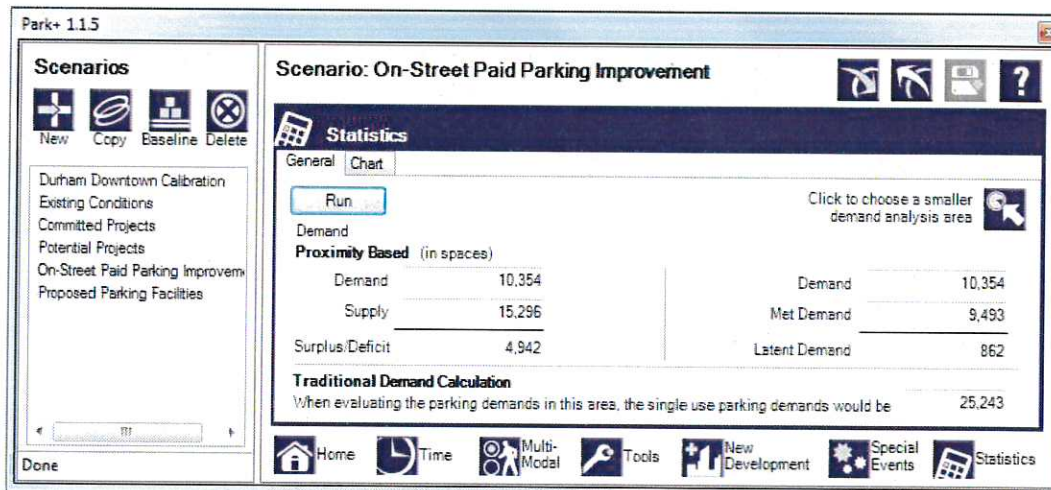


Figure 5.14 – Park+ Proposed Paid On-Street Parking Areas



Hourly and daily costs were input into the parking model and run as a function of the potential project scenario (defined in the previous section). The results are shown below.



The results indicate that there is a 10,354 space demand for parking versus a 15,296 space supply within the study area. The total demand represents the demand generated by all land uses, including the existing land uses, the committed projects, and the potential projects defined on the previous pages. The total supply represents the the entirety of the parking spaces found within Downtown Durham, including the existing spaces and those new spaces associated with committed development. These results are consistent with the previous scenario.

For this scenario, the output indicates that the latent demand is 862 spaces, which is a result of some demand tensions created by the potential new developments. The latent demand, which is created by the potential new developments without associated parking, represents demand that cannot be met within the specified walking tolerances and restriction patterns defined in the model. The latent demand is reduced slightly over the previous scenario. This reduction is due to the shift in parking demands off-street by some users, which frees up additional capacity for on-street spaces within the study area.

A comparison of on-street parking occupancy rates are shown in Table 5.2. The Park+ model results predicting the impact of paid on-street parking are visually represented in Figure 5.15.

Table 5.2 – On-Street Parking Occupancy Comparison

| Location | Existing Conditions | Committed Projects | Potential Projects | With Paid Parking |
|--|---------------------|--------------------|--------------------|-------------------|
| On-Street (locations where paid parking is proposed) | 77% | 80% | 86% | 78% |
| On-Street (locations where no parking fee is proposed) | 60% | 63% | 75% | 75% |
| Off-Street (Adjacent to Proposed Paid On-Street)* | 58% | 60% | 65% | 65% |

*Adjacent parking is within 500 feet of the proposed on-street paid parking areas

As evidenced from Table 5.2, implementing paid on-street parking reduces on-street occupancy from 86% to 78%, when considering the Potential Projects scenario. The non-paid on-street parking areas and off-street facilities within 500 feet of the recommended on-street paid parking areas maintain consistent occupancies with the implementation of paid on-street parking. Considering these two categories of parking remain constant, there is expected to be an increase in parking occupancy in facilities near the extents of the study area.

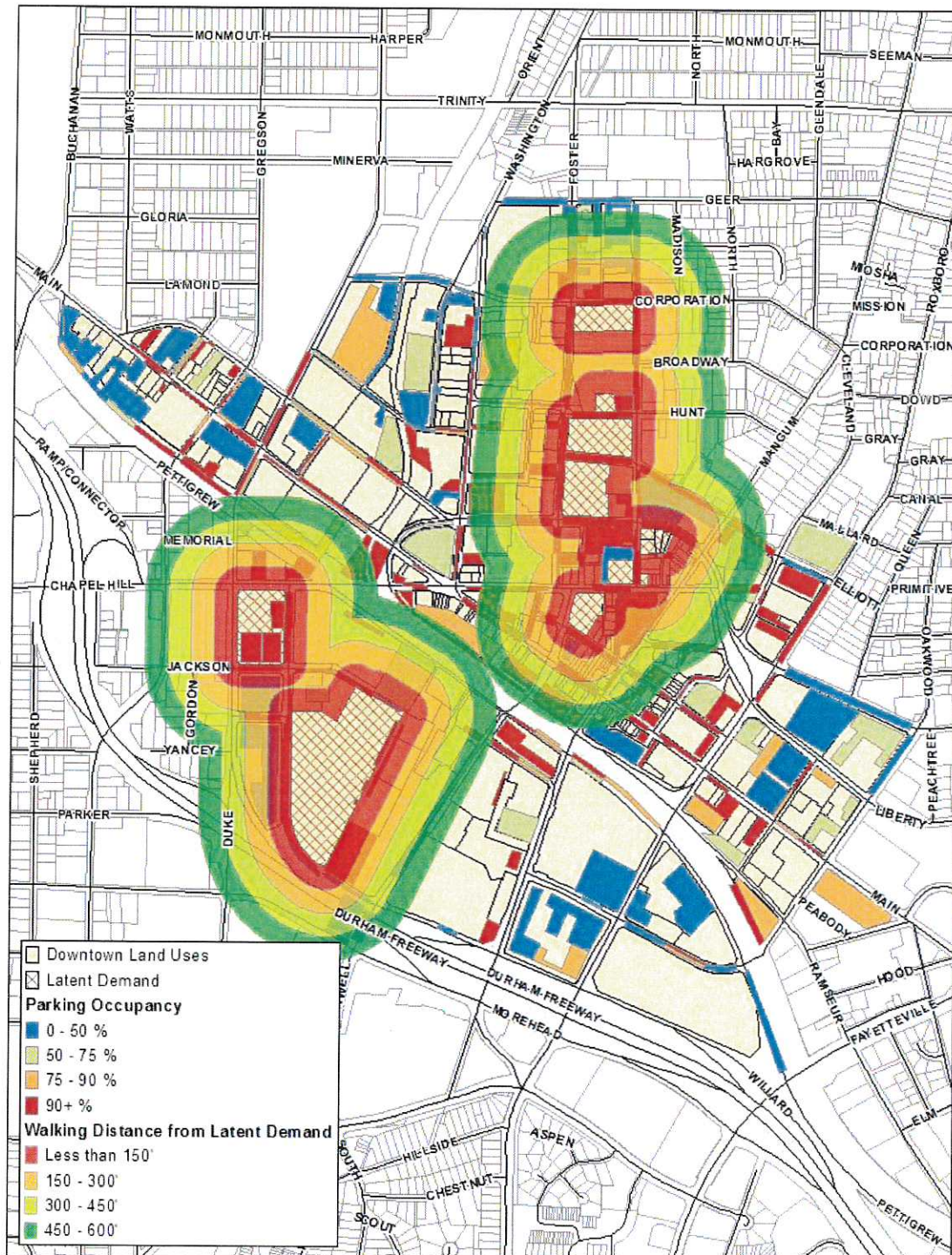


Figure 5.15 – Park+ On-Street Paid Parking Demand Projections
(2:00 PM, approximate peak hour)

Projected Conditions – Potential Parking Infrastructure

The final scenario is the introduction of new parking facilities, operated as public parking, to better serve the growing demands in the Downtown area. Based on the knowledge of future development and potential parking improvements in the area, the following parking facilities were modeled in the Park+ future demand scenario (shown visually in Figure 5.16).

1. Durham County Garage - the site is bounded by East Main, Liberty, and Queen Streets on the east side of downtown (two surface lots existing). Assumed to be 500 spaces, likely built in the next 5-10 years.
2. City Garage - site is likely to be either the southwest or southeast corner of West Morgan and Rigsbee. Assumed to be 500 spaces, likely built in the next 5 years.
3. Central Park Garage – site was generally assumed to be near Rigsbee and Corporation. Assumed to be 500 spaces, likely built a little further out to correspond with future development in the area.

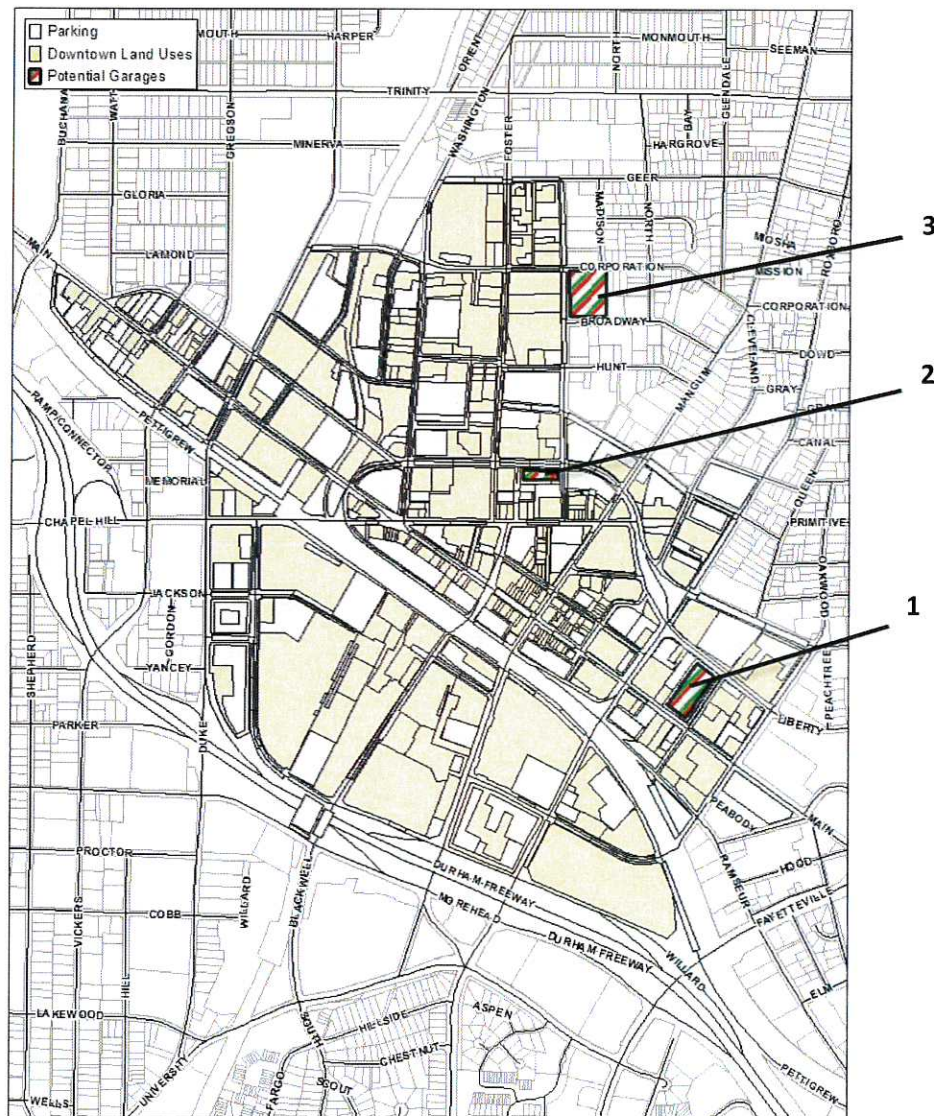
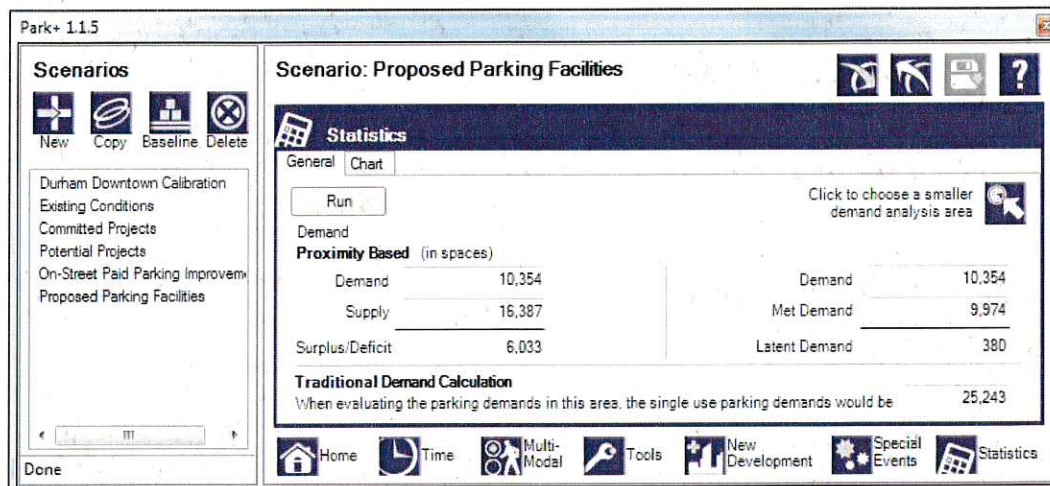


Figure 5.16 – Park+ Potential Proposed Parking Infrastructure



The results for this scenario indicate that there is a 10,354 space demand for parking versus a 16,387 space supply within the study area. The total demand represents the demand generated by all land uses, including the existing land uses, the committed projects, and the potential projects defined on the previous pages. The total supply represents the the entirety of the parking spaces found within Downtown Durham, including the existing spaces, those new spaces associated with committed development, and the potential garages outlined above.

For this scenario, the output indicates that the latent demand is 380 spaces, which is a result of some demand tensions created by the potential new developments. The latent demand, which is created by the potential new developments without associated parking, represents demand that cannot be met within the specified walking tolerances and restriction patterns defined in the model. The latent demand is reduced by approximately 482 spaces over the previous scenario, indicating that the location of the parking facilities is helpful in reducing some of the parking demand. Additional locations in the southern portions of the study area would help to mitigate the additional latent demand found in that area (although additional private parking associated with the potential developments could mitigate this during the development process). Results are graphically represented in Figure 5.17.

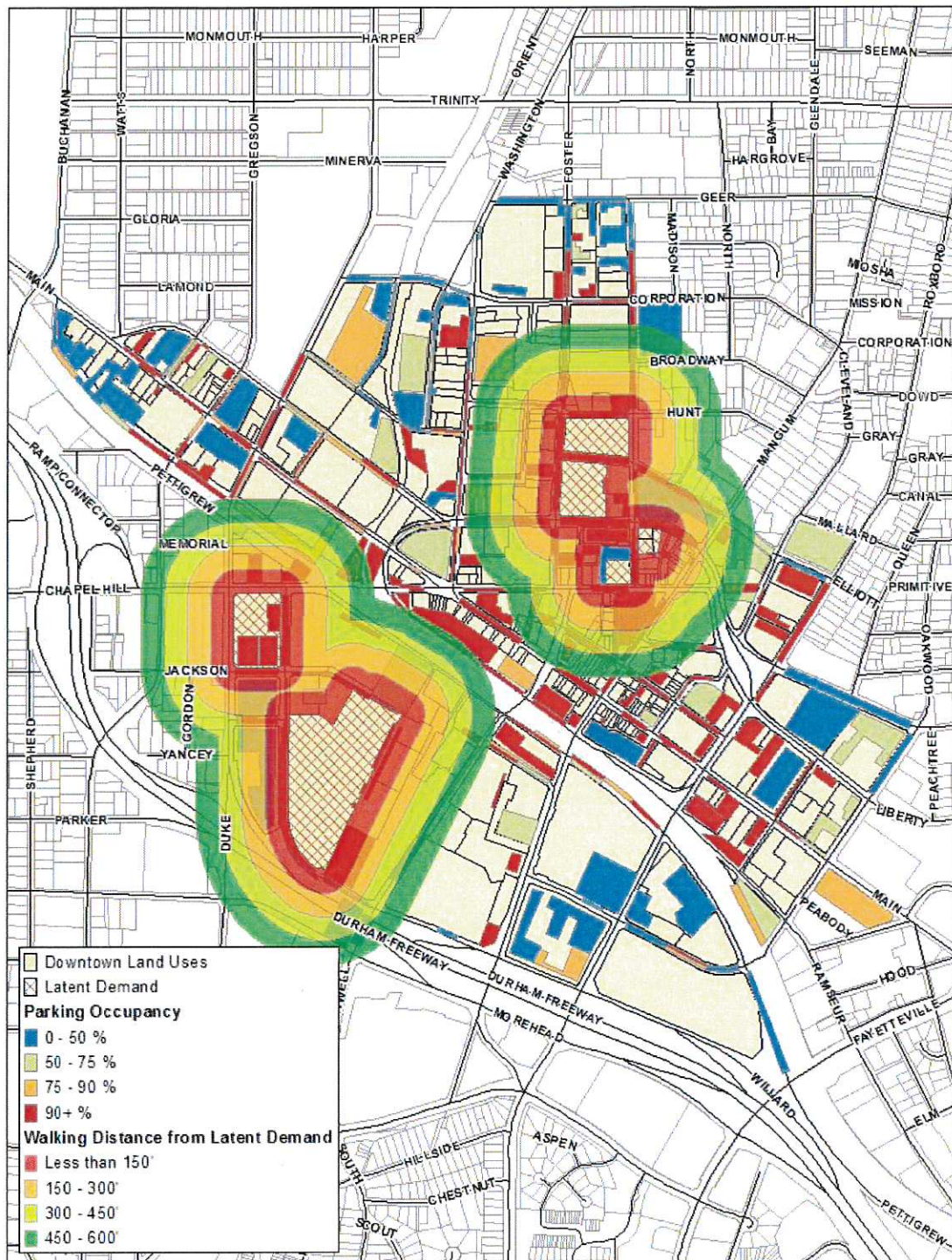


Figure 5.17 – Park+ Parking Infrastructure Demand Projections
(2:00 PM, approximate peak hour)

Parking Demand Analysis Conclusions

When reviewing the study area wide parking statistics from each scenario, it appears as if the Downtown area has a surplus of parking of at least 4,000 spaces, even in the worst case scenario. This result is deceiving and masks the fact that there are definitive localized deficiencies in each of the planning horizons, including existing, committed, and potential development levels. When looking at the results of the model more granularly, the results indicate that there are specific localized deficiencies, many of which are caused by the introduction of new development, even when that new development is not directly adjacent to the resulting deficiency or latent demand. The following summaries define the modeled conditions for each scenario.

Existing Conditions – The existing conditions scenario includes 7,946 spaces of demand versus a supply of 15,581 spaces, resulting in a surplus of 7,635 spaces overall. Despite this large surplus, there are still some localized areas of deficiency including much of the on-street parking and public parking in the Downtown Loop, which supports not only the land uses within its boundary, but also many uses within a reasonable walking distance outside of the loop.

Committed Projects – The committed projects scenario included seven new developments (four of which included dedicated parking). The results projected a demand of 8,783 spaces, an increase of 837 spaces attributed to the committed developments. With the additional parking of the new committed developments, the overall parking supply increased by 1,099 spaces and decreased by 459 spaces, with a net increase of 640 spaces, bringing the study area total to 16,221 spaces. The increased demand increases tensions around the various committed developments, putting more pressure on public parking supply in the area.

Potential Projects – The potential projects scenario includes 11 projects throughout downtown. No additional parking supply was projected with these development projects, such that the additional parking demand and its impact to the study area could be estimated. The results project a demand of 10,354 spaces, an increase of 1,571 spaces. The parking supply also decreased (because of new potential developments replacing surface parking) by 925 spaces to a total of 15,296 spaces. The tensions that were previously experienced around the public parking supply now result in a latent demand of 867 spaces, which represents parking demand that cannot be allocated based on walking distances and availability of parking.

On-Street Paid Parking Implementation – The first recommendations scenario looked at the implementation of paid parking in various areas throughout the study area. The scenario did not alter the demand and supply values from the previous scenario (10,354 spaces of demand vs. 15,296 spaces of supply), but the improvement did redistribute parking demand from the most visible and coveted on-street area into available off-street supply, balancing supply somewhat and making on-street spaces more available to absorb latent demand. As a result the latent demand was reduced between scenarios by a handful of spaces, from 867 spaces to 862 spaces.

Proposed Parking Infrastructure Implementation – The second implementation scenario looked at the implementation of new public parking facilities throughout the study area. The scenario added 1,500 structured parking spaces in three facilities, while removing 409 surface parking spaces for construction of the facilities. The demand for parking (10,354 spaces) remains consistent. The addition of the new parking facilities serves to reduce much of the demand constraints in the eastern and northern portions of the study area, with the overall latent demand reduced from 862 spaces to 380 spaces. This scenario is a good example of how the introduction of new parking facilities can impact not only the immediately adjacent areas, but also the community as a whole.

The results can be utilized to envision recommendations that rely on centralized and shared public parking to support new parking demands, while also combining private parking infrastructure to offset new demands generated from office and residential uses that require their own dedicated parking supply. The pursuit of



public-private partnerships for the development of parking would be an ideal solution to the need for incremental public supply additions, while maintaining lower construction costs through shared investment.

A key example for this type of development in the short term would be the Woolworth's site, located within the Downtown Loop. The Downtown Loop area, while sufficiently utilized and under capacity, has the perception of a shortage of public parking supply. Within this area, there are 4 primary off-street public parking facilities representing 2,160 spaces of supply (87% of total supply in the area). The occupancy of these facilities averages between 75 and 85% occupied, which is considered "approaching capacity" by industry standards. The completion of the Woolworth's development will only compound the potential parking problem in the area, pushing these public facilities to the brink of capacity. A suitable solution would be to engage the developer of this site in a public-private agreement, combining to develop public parking supply in conjunction with private parking infrastructure. The benefits to this type of agreement would be increased public supply, reduced capital costs for the City, and increased parking supply in the area for the promotion of business growth and overall economic development.

An additional recommendation from this section's evaluation would be to continue to maintain and manage the database associated with Park+ to give the City a more robust and realistic planning tool. The ongoing management and inclusion of data will give City planners more data points to use in the evaluation of new development and associated parking needs. The tool, when maintained properly, is a great resource to promote "right-sized parking" within the community, helping the City to better allocate and operate the existing parking resources, while efficiently maximizing the combination of parking needs and development densities within the community.